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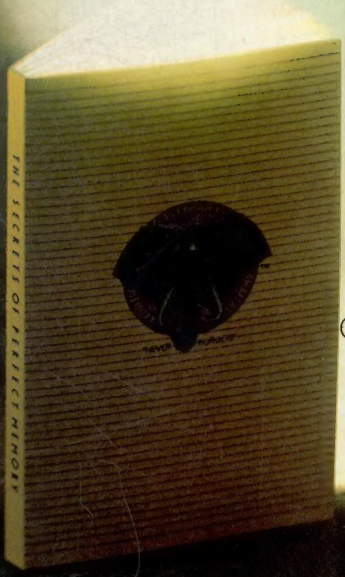
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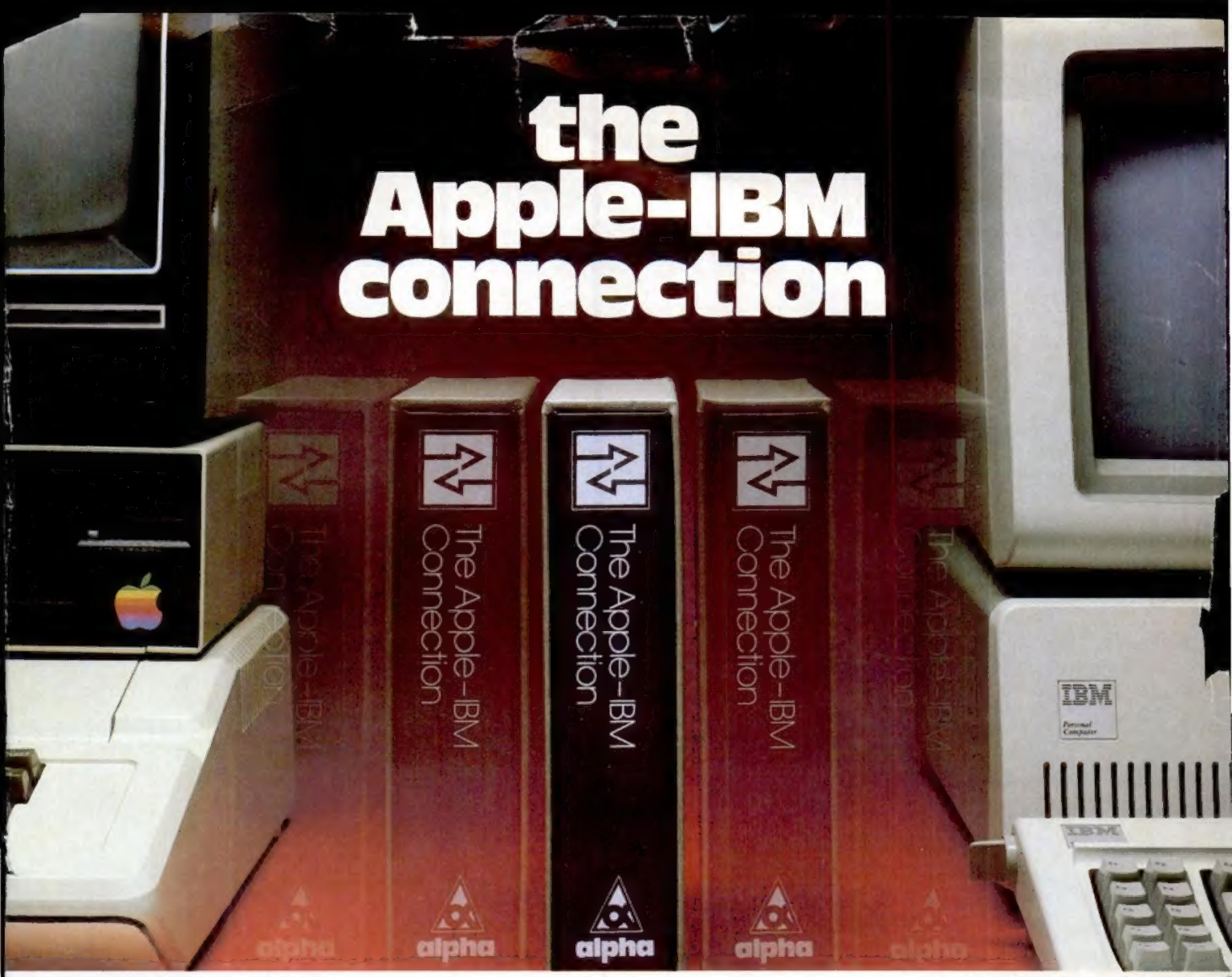
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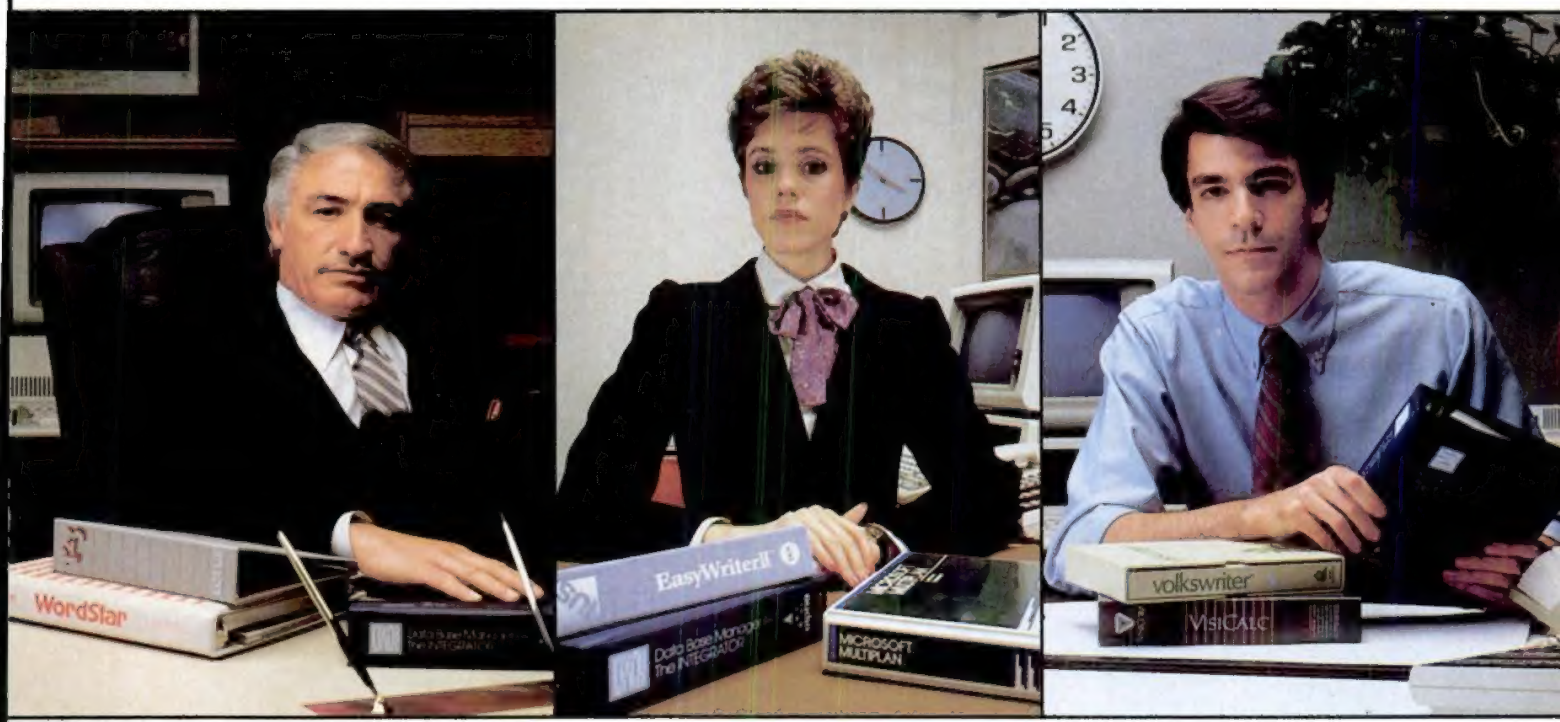
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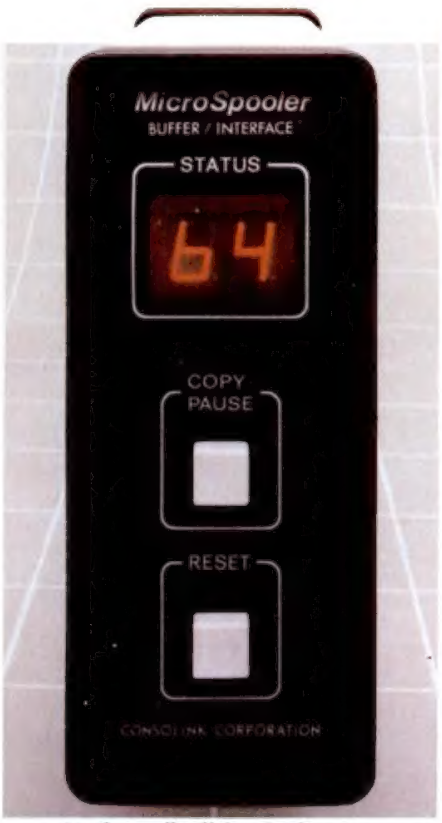
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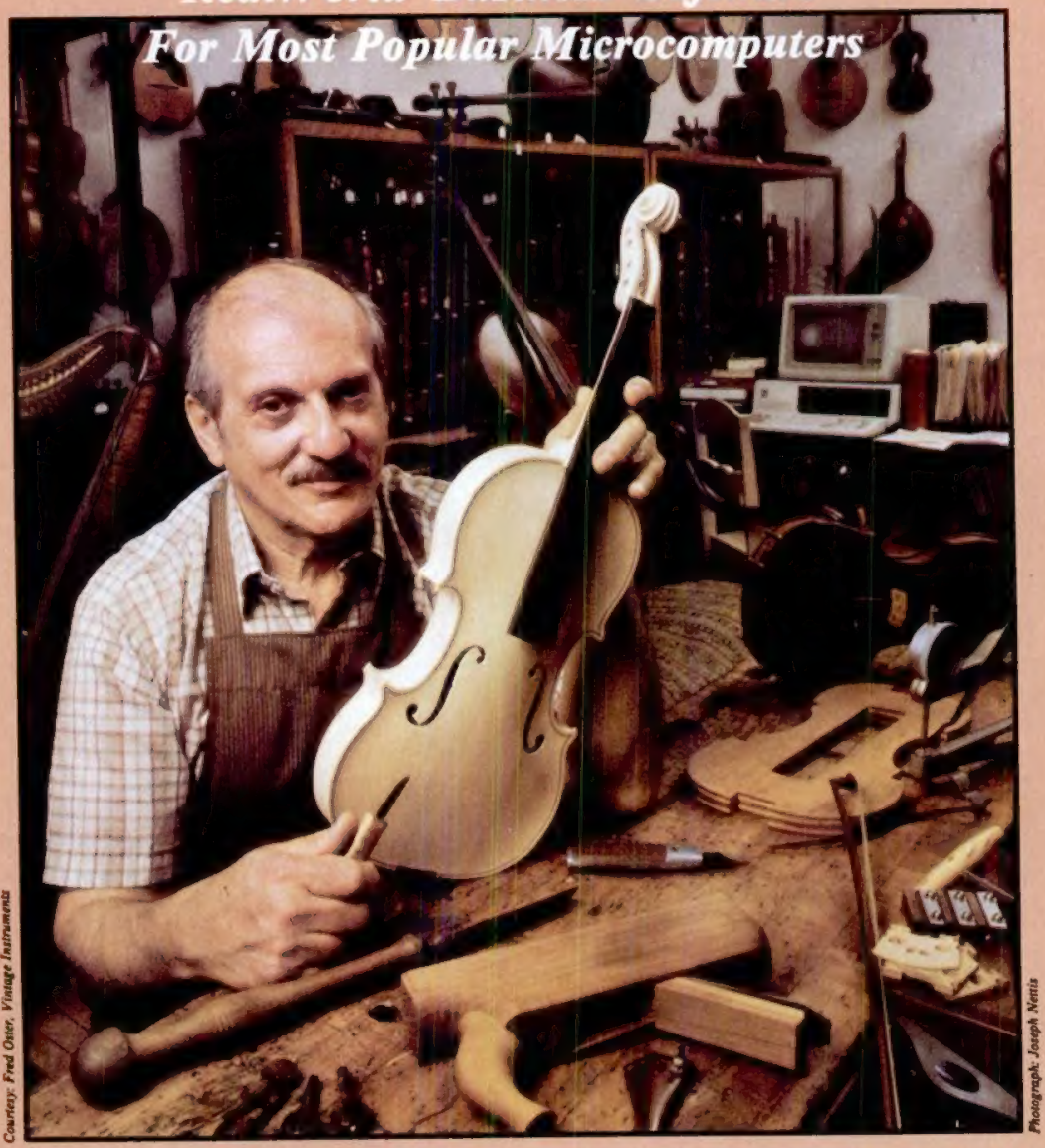
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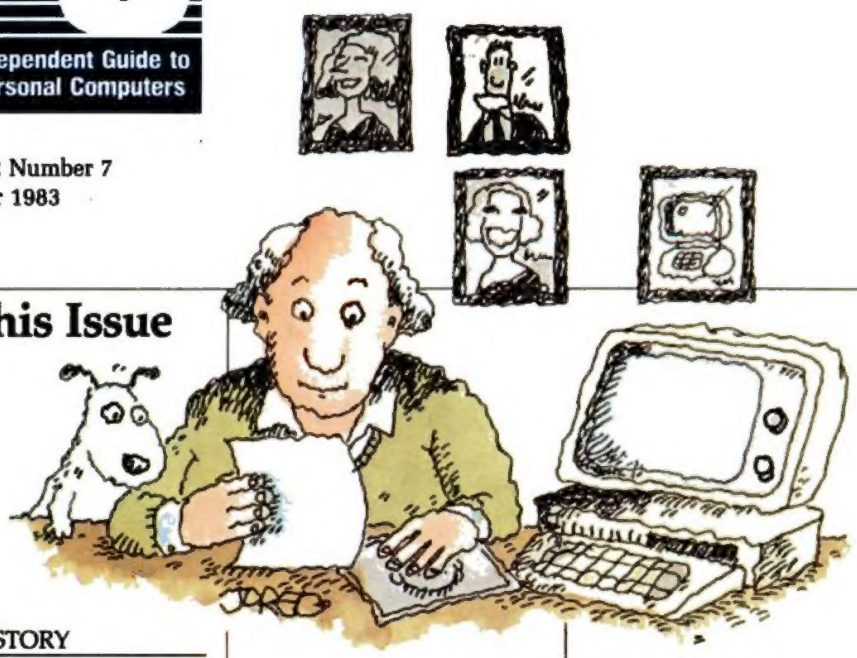
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Volume 2 Number 7
December 1983



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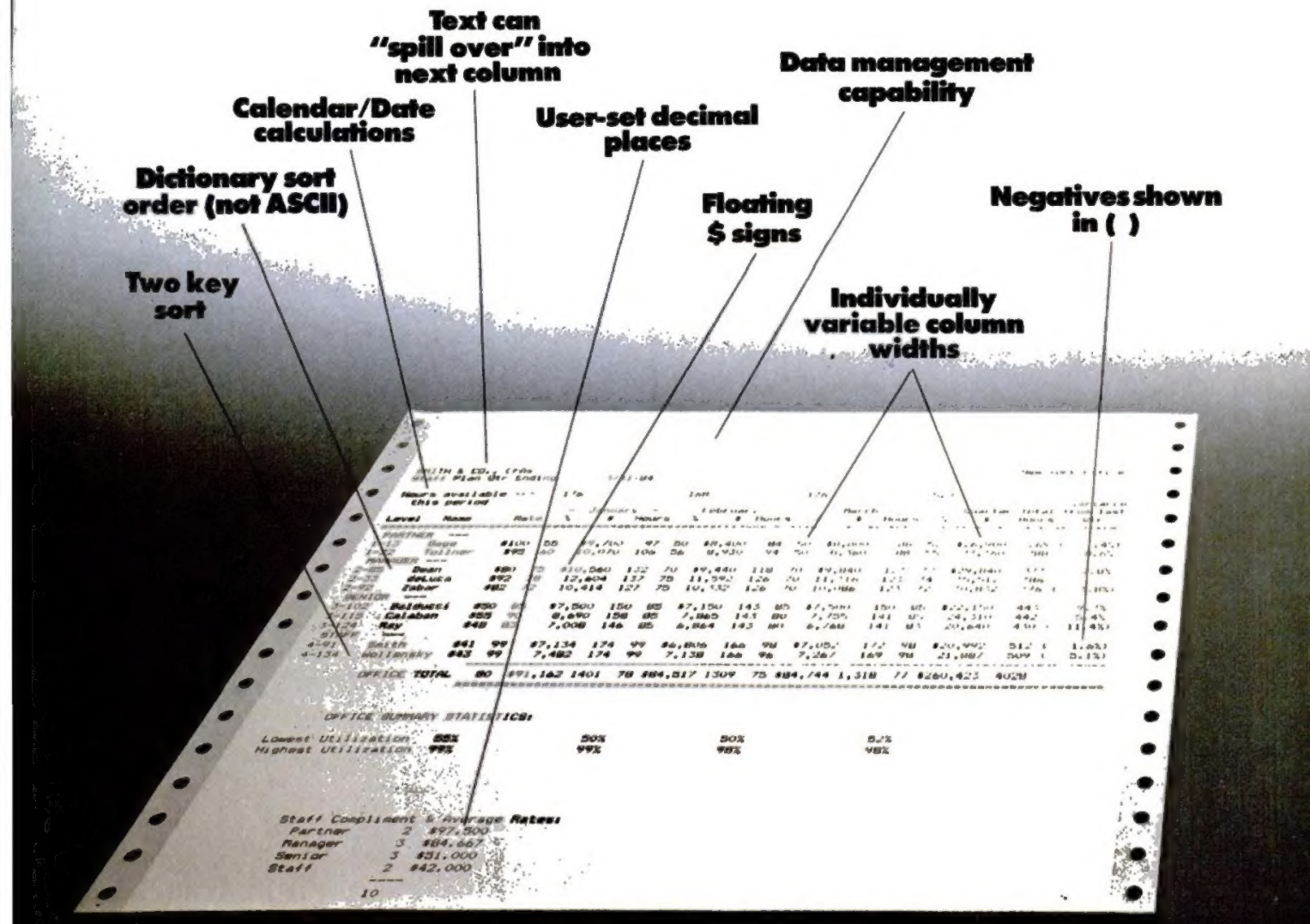
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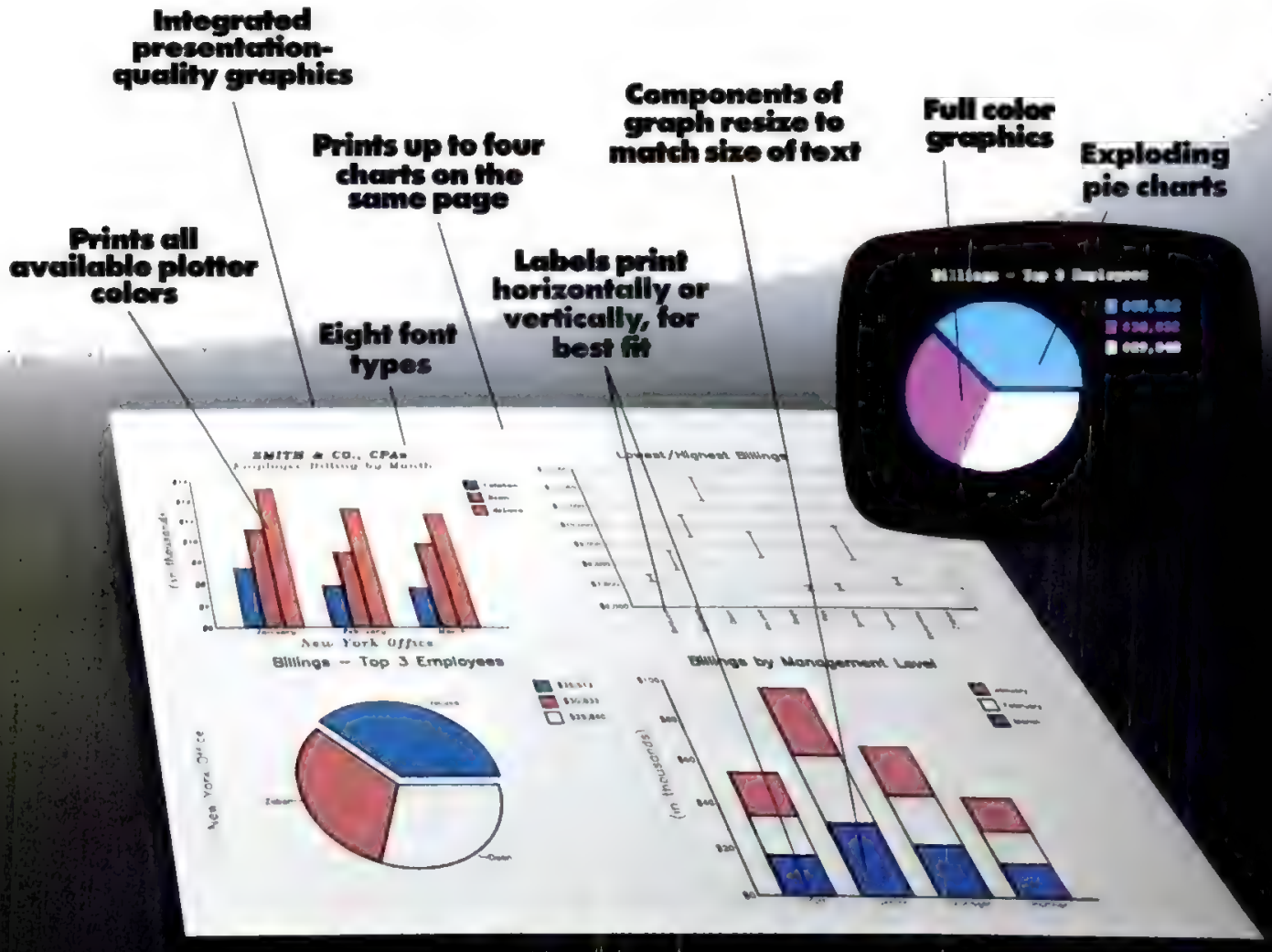
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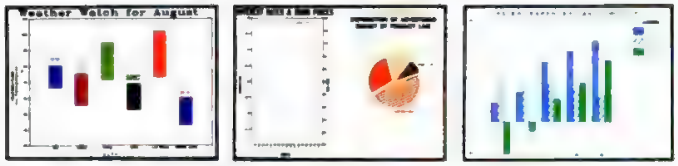
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  TEL 08802-691
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Chart-Master™ turns volumes of complex data into easy-to-understand graphics.



"A picture is worth a thousand words." With this simple concept as a building block, Chart-Master is changing the way busy executives, analysts and secretaries look at, interpret and present information. In a fraction of the time required to wade through volumes of printouts, you can produce easy-to-understand bar charts, pie charts and scatter diagrams quickly and dramatically. Chart-Master makes it easy to customize reports and presentations with six different fonts, label placement, proportional pie charts and more.



Values printed at data points; both left and right Y-axis scales; floating legends & bars; both horizontal & vertical formats; exploded pie sections.

Menu-driven Chart-Master allows you to enter data and select a chart format at the press of a button. You then preview your selection on your personal computer screen as it would appear in final form. Or, you can review the various Chart-Master graphic options to make sure you have selected the most effective format. When satisfied, you can transfer your selection to paper or acetate transparencies for a colorful, presentation-quality chart in seconds.

Chart-Master presents a *clear picture* of the "bottom line," which conveyors of information understand and decision makers appreciate. That's why major corporations like GE, Eastman Kodak, Exxon, Union Carbide, GM, AT&T, DuPont, 3M, Citibank, Motorola, Procter & Gamble, and GTE rely on Chart-Master to translate "volumes of complex data into meaningful information."

Chart-Master supports the IBM Instruments XY750, Panasonic VP Series, Houston Instruments DMP29, Yokogawa PL1000 and Strobe plotters, in addition to the Hewlett-Packard family of plotters, for use with IBM PC and other compatible computers.

The retail price of Chart-Master is $375. For a complete information kit and name of your nearest dealer, contact Decision Resources, Inc., 25 Sylvan Road S., Westport, CT 06880. (203) 222-1974.

DecisionResources
Software Designed for Decision Makers

CIRCLE 221 ON READER SERVICE CARD

No one else is using this simple method to teach you Lotus 1-2-3.

You didn't learn to swim by reading about it. You took the plunge. With a little extra support at first, 'til you could stay afloat on your own.



ATI's training software teaches you Lotus 1-2-3 in the same way.

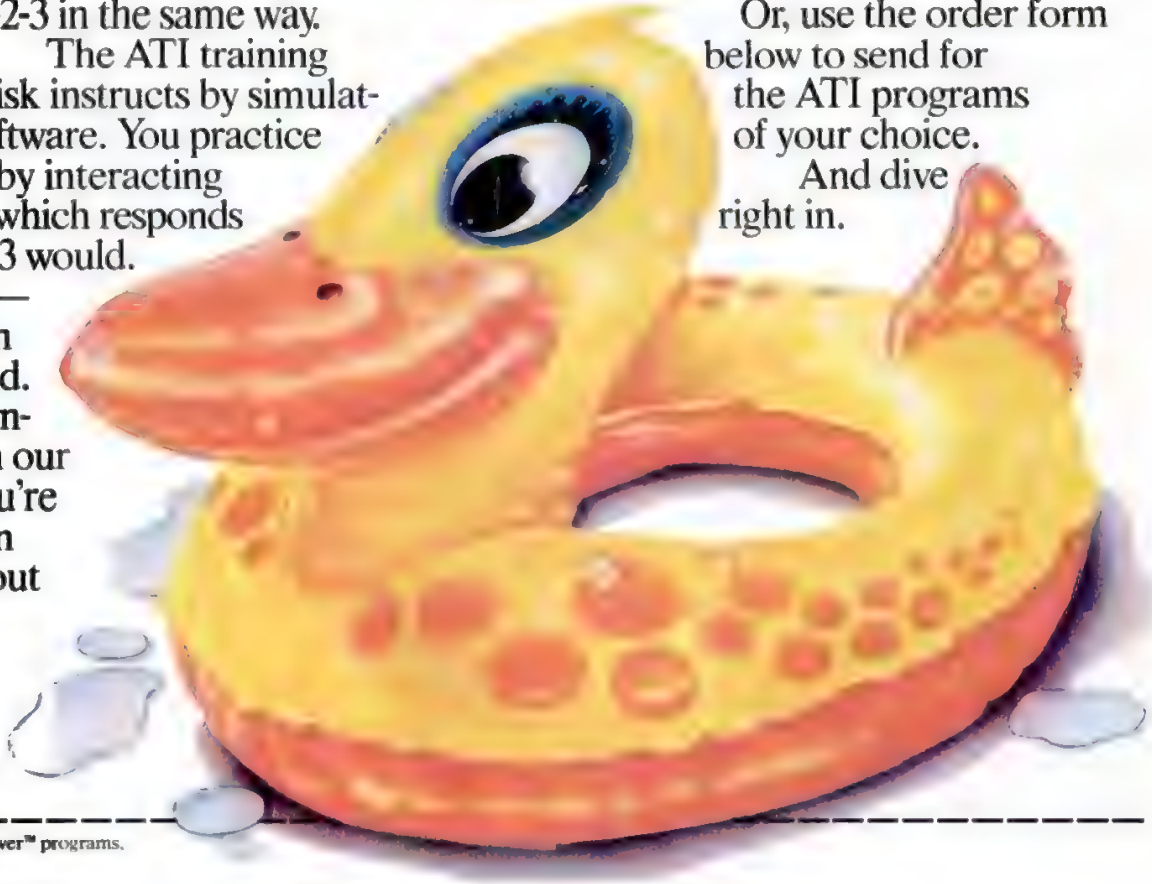
The ATI training disk instructs by simulating the actual software. You practice each command by interacting with the screen, which responds just as Lotus 1-2-3 would.

It's faster—and easier—than any other method. Once you've learned the skills with our helping hand you're ready to swim on your own. Without sinking.

The ATI Training Power package for Lotus 1-2-3, with disk and handbook, is available at your computer dealer. Along with our line of training programs, based on the same simulation method, for other popular software.

Or, use the order form below to send for the ATI programs of your choice.

And dive right in.



Please rush me ATI Training Power™ programs, at $75 each for this software:

Integrated Software
☐ Lotus 1-2-3

Database Management
☐ dBASE II-vol. 1 & 2
☐ EasyFiler

Word Processing
☐ WordStar-vol. 1 & 2
☐ EasyWriter II
☐ Perfect Writer
☐ Spellbinder
☐ Benchmark

Financial Planning
☐ Multiplan
☐ SuperCalc
☐ VisiCalc ($50 Limited Offer)
☐ Perfect Calc
☐ EasyPlanner
☐ Microplan

Operating Systems
☐ PC DOS
☐ MS DOS
☐ CP/M

Programming
☐ BASIC
☐ APPLESOFT BASIC

Accounting
☐ BPI Gen. Acct.
☐ Peachtree General Ledger*
☐ Peachtree Accounts Receivable*
☐ Peachtree Accounts Payable*

*PC(MS) DOS formats only.

ATI Money Back Guarantee
If you're not completely satisfied with how fast you learn with ATI Interactive Training Power Programs, simply return within 3 days for full purchase refund.

Enclosed is $75 each plus $2.50 shipping. Visicalc Training $50. (CA add 6.5%)

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Street _____

City _____ State _____ Zip _____

My computer uses:
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☐ MS DOS ☐ APPLE II CP/M
☐ CP/M ☐ APPLE IIe 80 col.
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My computer brand is _____

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(213) 546-4725

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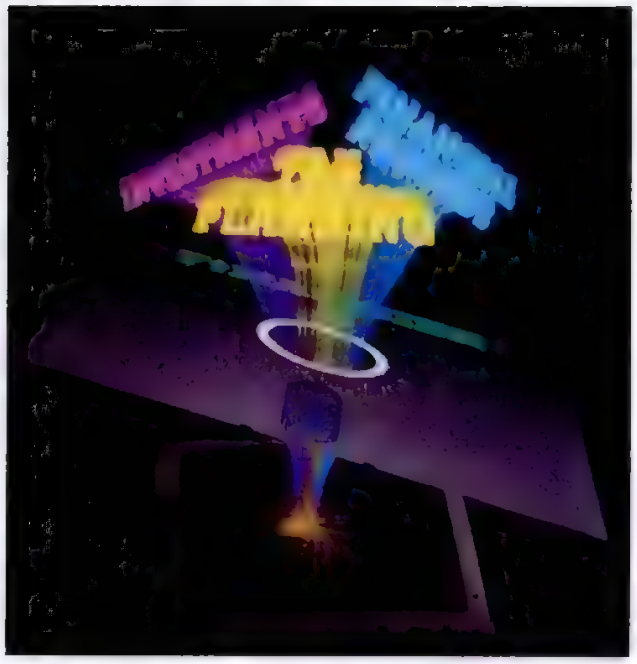
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Software Training Company
A Division of ATI
3770 Highland Avenue, Suite 201C
Manhattan Beach, CA 90266

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CIRCLE 116 ON READER SERVICE CARD

No other financial software even comes close.



Introducing Financier II

Now you can have a completely integrated financial software system.

Now Financier II
The financial software that has met with resounding approval from professional software reviewers just got even better. Now, the Financier Personal Series has been upgraded to Financier II. Combined with Financier's Tax Series and Investor's Series, it creates a totally integrated financial management system. Financier II is so easy to use that it is ideal for personal finance yet powerful enough, and flexible enough, to function as a small business system.

"It is clear that the Financier Personal Series is the most sophisticated and flexible of the financial programs under review here."*

Burton Alperson, Ph.D.
Reviewer, SOFTALK
June, 1983

Financier II features enhanced graphics capabilities, and expansion of Financier's unique auto-checking capability which prints checks directly from a user-maintained database, while updating bank, budget and tax records. Additionally, it provides a full range of professional-caliber financial statements including net worth, and cash flow reports. You can even opt for double-entry accounting methods, if desired.

"Out of all these programs,** the Financier Personal Series provides the best balance of extensive capabilities and ease of use. The manual is outstanding as an introduction to [illegible] practice of bookkeeping, and the use of a personal computer to perform this task."

Steven Yoder and
Sherry Knight, CPA
PC Magazine, February, 1983

Financier II is remarkably easy to use.
You don't have to be a computer whiz-kid to use Financier II. That's because it's menu-driven. When you need to enter data, just fill in the blanks on the preformatted screen. If you can use an automatic teller machine, you're well on your way to mastering this unique financial software.

Another thing that puts Financier II so far in front of any other financial software package is that it offers powerful tax and inventory functions. In fact, Financier II allows you to maintain literally thousands of these accounts, if you desire. And, each account is separately manageable.

[illegible] and a year-round record-keeping [illegible]rogram (Personal Series)." Augustin Hedberg
Money, June, 1983

Financier Tax and Investor's Packages.
Financier's Tax and Investor's Series provide the perfect adjunct to Financier II.

Financier's Tax Series lets you create multiple tax cases, and store them for later adjustment. You can even perform "what-if" spreadsheet calculations, generate graphics and print charts.

Financier's Investor Series is a comprehensive portfolio management system that lets you maintain a data base on each security account, each security position, and each security transaction.

Financier Offers Something for Everyone.
Individuals, businessmen, tax preparation specialists, investors or anyone who wants real financial control cannot afford to miss out on Financier's powerful software packages.

Get the most from your personal computer with the financial software that does the most. Financier II, and Financier's Tax and Investor's Series.

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Financier, Inc., 2000 West Park Drive, Box 670, Westboro, MA 01581 (617) 366-0950

*Apparant Home Finance™, Perfin™, PC/PFP™, Home Accountant Plus™, Financier Personal Series™
**Bonus Accounting System™, Financier Personal Series™, FMS II™, Home Accountant Plus™, Money Maestro™
Financier software is available for IBM® PC, IBM® XT, Digital Rainbow™ and Wang® PC

CIRCLE 241 ON READER SERVICE CARD
CIRCLE 241 ON READER SERVICE CARD



Choosing the right tax shelter is more than a game of chance.

Choosing good investments will always be something of an art. But it shouldn't be a game of chance.

INTRODUCING THE STRATEGISTS. XQ Software introduces two new software programs that take some of the gamble out of your investment decisions; the Investment Strategist and the Tax Strategist. Designed for investors and investment advisors, they turn your IBM Personal Computer into a sophisticated tool for analyzing the tax and investment aspects of tax sheltered investments.

MAKING INFORMED INVESTMENT DECISIONS...THAT'S THE STRATEGY. These innovative programs tackle three tough questions:

How much tax shelter do you really need? The TAX STRATEGIST tells you how much shelter is right for your financial situation. It helps you plan strategies for reducing your tax liability.

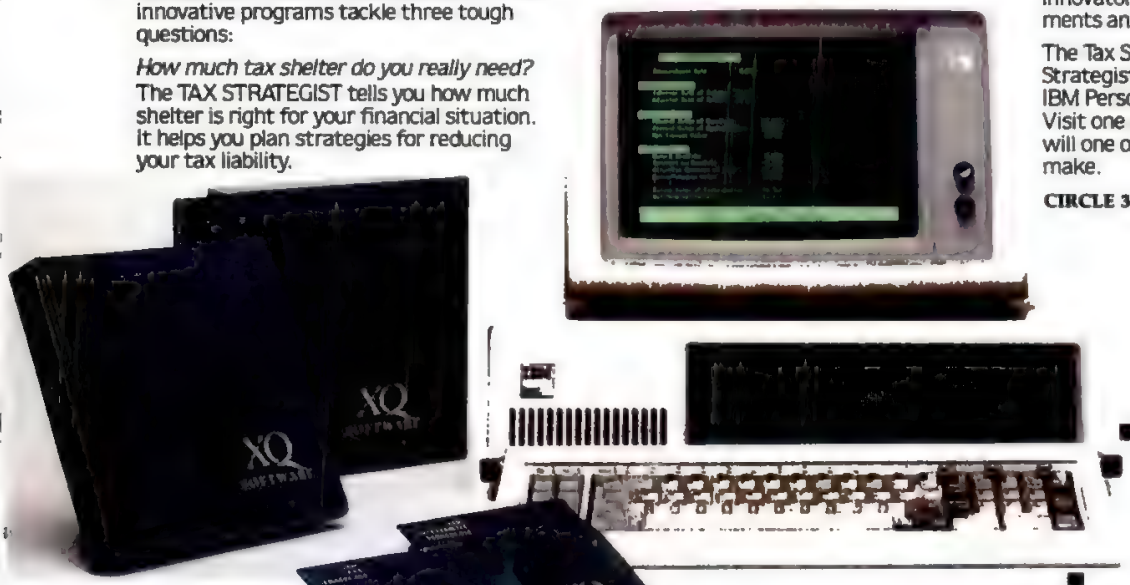
Is this tax shelter a good investment? The INVESTMENT STRATEGIST helps you determine which tax shelters are good investments. You can compare tax shelters with each other and with other types of investments.

Does the tax shelter match your tax profile? The INVESTMENT STRATEGIST and the TAX STRATEGIST work together to help you find the shelters that match your personal needs. Now you can zero in on the best tax and investment approach.

THE COMPANY BEHIND THE SOFTWARE. XQ Software is an Intelligent Systems company. For over a decade Intelligent Systems has been an innovator in personal computer enhancements and color graphic peripherals.

The Tax Strategist and the Investment Strategist are available through authorized IBM Personal Computer dealers nationwide. Visit one and ask for a demonstration. It will one of the best investments you'll ever make.

CIRCLE 381 ON READER SERVICE CARD





THE INVESTMENT STRATEGIST™
$395

THE TAX STRATEGIST™
$395

(SOLD INDIVIDUALLY)

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PC 12/83

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MAIL TO: XQ SOFTWARE, 4357 PARK DRIVE/NORCROSS, GA 30093

With all the clamor about personal computers, a fundamental fact is often overlooked: some simply *work* better than others.

Consider the COMPAQ Portable.

A computer will make you more productive. A computer will make you more efficient. You hear it everywhere. But you don't hear about which computer actually *works* best.

A computer isn't magic. It's a tool. And just like other tools, some computers work better than others.

The COMPAQ™ Portable is a combination of 20th-century electronics and 19th-century pragmatism. It simply does personal computing better. Here's why.

Works in more places

You don't do all your thinking in one place. Why have a computer that stays in one place?

The COMPAQ Portable has all the capabilities of a large desktop computer. But now those capabilities can go where you go.

You can move it from office to office to share its resources. You can move it into the conference room to answer questions when and where they come up.

With the COMPAQ Portable, you can be as productive in your hotel room or your lake house as in your own office. It's a reliable companion on a business trip. It's a powerful sales aid in your customer's office.

What's more productive than a computer? A computer that works for you in more places.

Works with the greatest number of programs

The most important consideration when you choose a computer is "what programs will it run?" And that's one more reason for choosing the COMPAQ Portable.

The COMPAQ Portable runs more programs than any other portable. In fact, it runs more than most non-portables. That's because it runs all the popular programs written for the IBM® Personal Computer. There are hundreds of them. They are available in computer stores all over the country, and they run without any modification, right off the shelf.

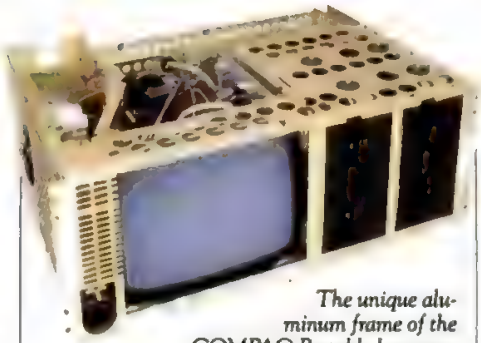
Imagine the power of a *portable* word processor. There are dozens of different word processing programs available for the COMPAQ Portable.

Planning, problem-solving, and "what-ifs" are a cinch with a variety of popular electronic spreadsheet programs. The COMPAQ Portable runs them all.

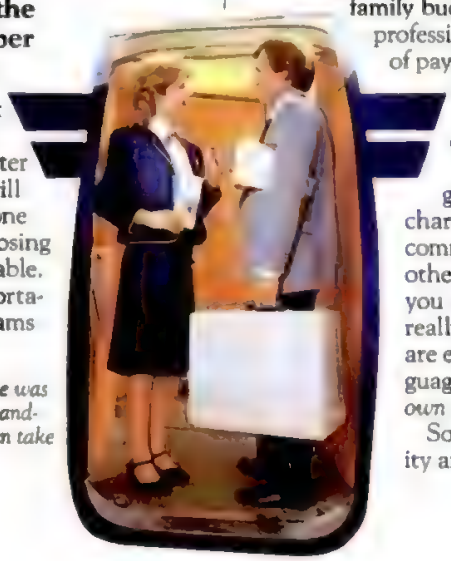
There are accounting programs for anything from computerizing your family budget to full-scale professional management of payables, receivables, inventory, and payroll for your company.

There are programs for making charts and programs for communicating with other computers. Or if you want something really specialized, there are even program languages for writing your *own* programs.

So, you get portability and you don't give up problem-solving power. The combination adds up to the most useful personal computer on the market today.



The unique aluminum frame of the COMPAQ Portable has cross-members that strengthen it front-to-back, side-to-side, and top-to-bottom. It's a design practice commonly used in race cars.



The COMPAQ Portable was designed to fit under a standard airline seat so you can take it on business trips.

Works better because it's easy to read

The display screen of the COMPAQ Portable measures nine inches diagonally. It shows a full "page width" of 80 characters on a line so tasks like word processing are easier. And those characters are big enough to read even if you're leaning back in your chair.

The display shows both high-resolution graphics and easy-to-read, upper- and lowercase characters. One screen for all the information. With some personal computers, including the IBM, you can have either the graphics or the legible characters, but you can't have both unless you buy two different displays.

Incidentally, computer prices are often quoted without a display. The display of the COMPAQ Portable is built in, of course.



There are hundreds of useful programs for the COMPAQ Portable because it runs all the popular programs written for the IBM.

Add-on options make it work the way you work

Inside the COMPAQ Portable are three open slots. Electronic devices called expansion boards fit those slots and give the COMPAQ Portable new powers.

Just like the programs, expansion boards designed for the IBM work with the COMPAQ Portable, so there are dozens available right now. With them, you can make your personal computer more personal.

Want to check a stock price? Or look up something in The New York Times Information Service? One expansion board enables the COMPAQ Portable to handle those communications over ordinary phone lines.

Want to use your company's central computer files while you're on a trip? There are boards that allow the COMPAQ Portable to communicate with a variety of large mainframe computers.

Other boards let you hook up controllers for computer games or increase memory capacity. Still others let you connect personal computers in a network so several people in your office can share the same information.



Inside the COMPAQ Portable are three slots for optional electronics that can add new capabilities. Most portables have none.

Works better because it's tough enough for the road

Portable doesn't just mean smaller. Portable means tough, too.

The COMPAQ Portable was built to withstand the hard knocks of constant travel. An aluminum frame within the case completely surrounds the computer's working components. Each disk drive is mounted in rubber shock absorbers instead of being bolted directly to the frame.

To test internal components, the COMPAQ Portable was subjected to impacts of 40 G's *while running a program*. After impacts on each side, there was no internal damage and the program was still running. Without error.

Computers are for getting rid of worries, not giving you new ones.

Designed to help you work better, too

The COMPAQ Portable was designed to *feel* good.

Specifications

Software
- ☐ Runs all the popular programs written for the IBM PC

Memory
- ☐ 128K bytes RAM
- ☐ Expandable to 640K bytes

Storage
- ☐ One 320K-byte minifloppy disk drive, second drive optional

Display
- ☐ 9-inch (diagonal) monochrome screen
- ☐ 25 lines by 80 characters
- ☐ Upper- and lowercase, high-resolution text characters
- ☐ High-resolution graphics

Expansion board slots
- ☐ Three IBM PC-compatible slots

Interfaces
- ☐ Parallel printer interface
- ☐ RGB color monitor interface
- ☐ Composite video monitor interface
- ☐ TV RF modulator interface
- ☐ Communications interface optional

Physical specifications
- ☐ Totally self-contained and portable
- ☐ 20″W × 8½″H × 16″D

The keyboard is detached so it can fit into your most comfortable working position.

The keyboard cable remains connected at all times. So you don't have to unpack it and hook it up every time you use your computer.

Because the display is built in, the COMPAQ Portable makes a neat, small package on your desk, instead of a big obstacle you have to talk around. The built-in display also avoids the usual cable clutter because there's no need for separate cables for the display.

The COMPAQ Portable even has an electronically synthesized sound to create the familiar keyclick of a typewriter. With a simple keyboard command you can adjust the volume to suit the level of background noise in your office.

The added usefulness is free

The COMPAQ Portable can do what desktop computers do and do it in more places. But it doesn't cost any more than an ordinary desktop.

In fact, it costs hundreds less than a comparably equipped IBM or Apple® III. The COMPAQ Portable comes standard with one disk drive and 128K bytes of memory, both of which are usually extra-cost options. A second disk drive and additional memory are available to make your COMPAQ Portable even more powerful.

The bottom line is this—you just can't buy a more practical, useful, productive computer. Before you decide on a computer, you owe it to yourself to compare the COMPAQ Portable.

For the location of the Authorized Dealer nearest you, call 1-800-231-9966.

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The most computer you can carry



Incredible Trainers!

No matter what level IBM Personal Computer training you want, our interactive tutorial software gives you the answers. Easier, faster, smarter.

Take **The INSTRUCTOR,** for first-time users. PC Magazine called it, **"The best . . . introduction to the PC around."** It's #1 because it takes the work out of learning initial PC operations.

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You've got to see (and hear) it to believe it! Designed for PC users ready to learn higher level PC concepts, including DOS commands. Professor DOS will challenge you, amuse you, and amaze you.

Both programs use vivid graphic images, creative animation, sound and living color to take you from mystery to mastery of your IBM PC. Each is totally self-paced. And they're "people-literate." So you really do learn.

The most sought-after computer-assisted training anywhere. Available at IBM PC dealers and software retailers everywhere, separately or in a tutorial set. Affordable at a suggested list price of **ONLY . . .**

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Requires MS-DOS, any IBM Personal Computer or Compaq Personal Computer with at least one diskette drive and a monochrome or color display.

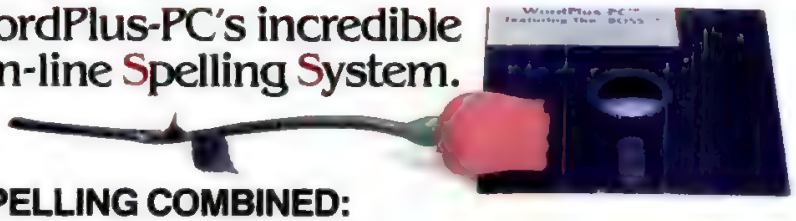
Phone and dealer inquiries welcome.

CIRCLE 529 ON READER SERVICE CARD

An Industry First in Word Processing Software:

WordPlus-PC™ featuring the BOSS™. Word processing so smart it can even spell 100,000* words.

Meet the BOSS. WordPlus-PC's incredible new Built-in On-line Spelling System.



WORD PROCESSING AND SPELLING COMBINED:

WordPlus-PC featuring the "BOSS" is a whole new technology in word processing software. Finally, the most powerful word processing capabilities have been combined with a built-in electronic spelling system which not only *checks your spelling* but also *corrects your spelling.*

The "BOSS", an acronym for Built-in On-line Spelling System, eliminates embarrassing spelling errors in your letters and stops time consuming trips to the dictionary.

But WordPlus-PC featuring The "BOSS" will do far more than just check and correct your spelling. It's been designed to be exceptionally easy to use and yet contain all the powerful features you expect and more. Like built-in mail merge for personalized form letters, invoice generation and the ability to merge information created by most other popular programs such as 1-2-3™ and dBASE II.™ And if you have a question, just press the HELP key to get back on track.

You can also print bar graphs and other charts,** easily move columns, scroll horizontally, execute global search and replace, boilerplate text, and even print proportionally spaced on selected printers. And WordPlus-PC is compatible with virtually all popular letter-quality and dot matrix printers.

*With 90,000+ word standard dictionary and ability for a user to add over 10,000 "custom" words.

HERE'S HOW THE BOSS WORKS FOR YOU:

IT CHECKS



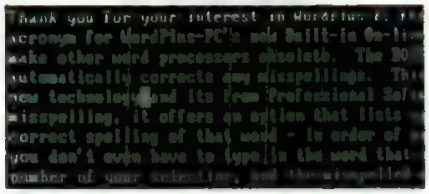
At the touch of a button, virtually anytime during typing or after the creation of a document, The "BOSS" locates and *highlights misspelled words* on your screen. The "BOSS" can even check the spelling of a word directly after it's been typed in.

IT SUGGESTS



When a word is misspelled, the user can ask The "BOSS" for suggestions as to how to correctly spell the word. With only one keystroke, The "BOSS" will display, in a dynamic on-screen window, up to eight *spelling suggestions in the order of probable phonetic correctness.*

IT CORRECTS



And The "BOSS" *Auto Correct* feature enables users to "fix" these misspelled words directly in text with a single keystroke. The "BOSS" is a total spelling system that Checks, Suggests, and Corrects your Spelling. All built-in.

THE TOTAL WORD PROCESSING SOLUTION — PLUS ALL THE HELP YOU'LL NEED.

With over 70,000 word processors in use worldwide, Professional Software, Inc. has designed WordPlus-PC to contain all the powerful features you expect — and to be the easiest word processor to use anywhere. But there will always be questions. That's why Professional Software has an entire bank of Nation-wide TOLL FREE customer HELP lines to support our registered users. This service is available at No Charge during the 90 days following the receipt of your registered users card.

Demand to see the BOSS in person
Visit your local professional computer dealer or call us toll free for the dealer nearest you. Once you witness the BOSS in action, you'll see that all other word processors have become totally obsolete.

Demand to see the "BOSS" today! Call us toll free, 1-800-343-4074.

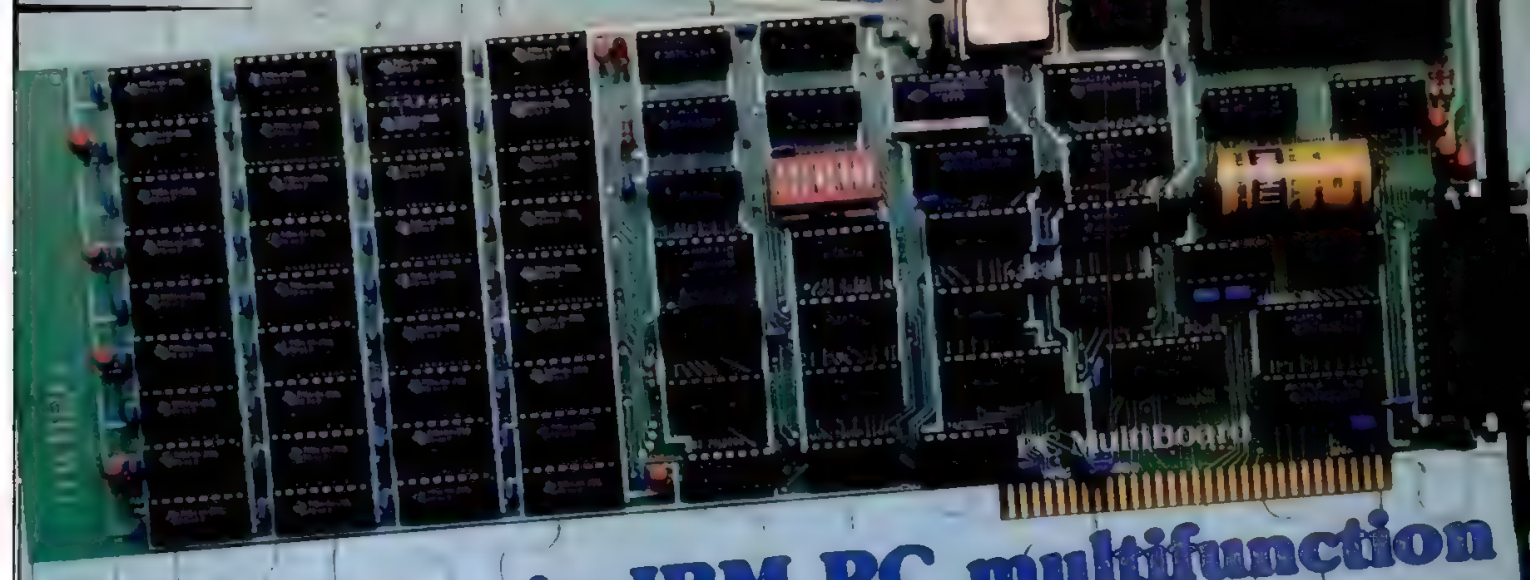
Professional Software, Inc.

51 Fremont Street, Needham, MA 02194 Telephone (617) 444-5224 Telex 951579
Now Available for IBM-PC and Compatibles, DEC Rainbow, TI Professional, and Victor 9000.
Dealer, distributor, OEM manufacturer, and international inquiries are invited.

WordPlus-PC and The "BOSS" are trademarks of Professional Software, Inc.
1-2-3 is a trademark of Lotus Development Corp., dBASE II is a trademark of Ashton-Tate.
Specifications are subject to change without notice.

WordPlus-PC was designed and written by Andres Escallon.
**With IBM dot matrix and Diablo 630 ECS printer, bar graphs and other charts can be printed inside text.

CIRCLE 374 ON READER SERVICE CARD



What's new in IBM PC multifunction expansion boards?

Indigo has put together the most versatile expansion product available for the new IBM PC and IBM PC / XT

the PC MultiPak™

- **4 most requested hardware functions**
  The PC MultiPak™ includes a serial communications port, a real time clock calendar with a 10 year lithium battery, 0 to 256K memory and optional parallel printer port. The PC MultiPak™ without the parallel printer port is ideal for users with the IBM monochrome/parallel printer adapter installed.
- **Zero memory option**
  The PC MultiPak™ is available with no memory installed so you can fill your I / O needs today and still have memory expansion capability to an additional 256K for your future needs. This makes the PC MultiPak™ the perfect mate for the new IBM PC and IBM PC / XT.
- **4 software packages**
  The PC MultiPak™ includes our four most popular software packages. **Drive-It™** converts 32K to 320K of extra memory into an ultra-fast drive. **Spool-It™** utilizes up to 64K of extra memory as a printer buffer and eliminates valuable time spent waiting on the printer. **Print-It™** prints any IBM text or graphics screen to Epson printers. **Color-It™** prints screens to IDS printers. Color images can be printed on IDS prism printers. These software programs have received critical acclaim in Infoworld, Softalk, PC Age and Creative Computing magazines. Thousands have been sold separately. This $200 retail value is included in the PC MultiPak™ at no additional charge. DOS 2.0 Compatible.
- **5 year warranty**



$297
- ALL SOFTWARE INCLUDED
- NO INSTALLED MEMORY

64K-$365, 128K-$432, 192K-$499, 256K-$565
PARALLEL PORT OPTION ADD $30
64K MEMORY EXPANSION KIT $87
SOFTWARE AVAILABLE SEPARATELY
DRIVE-IT $59.95, SPOOL-IT $44.95
PRINT-IT $44.95, COLOR-IT $49.95

VISA

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Dealer And Customer Inquiries call TOLL FREE 1-800-231-9480
In Texas Call Collect (713) 486-6166

CIRCLE 274 ON READER SERVICE CARD

indigo data systems, inc

100 E. NASA Rd. 1, Suite 106, Webster, Texas 77

In the Hard Disk Jungle Tallgrass Clears a Path



In today's hard disk jungle, Tallgrass clears a path by offering high performance, integrated mass storage solutions for the IBM® PC and compatibles, the T.I. Professional and the Victor 9000 computers.

TALLGRASS INNOVATIVE FEATURES

MASS STORAGE SYSTEMS with formatted HardFile™ capacities of 6, 12, 20, 35 and 70 Mb, all with built-in tape backup.

CONVENIENT INTEGRAL TAPE BACKUP SYSTEM allows rapid tape "image" streaming, or incremental file-by-file backup and restore on ANSI standard inexpensive data cartridges, instead of the usual floppies, video cassettes, or low-capacity removable Winchester devices.

NETWORK READY and fully compatible with networks such as PCnet® and EtherShare.™

HIGH RELIABILITY with dual directory and read-after-write verify options. A dedicated landing zone, where the read/write heads reside when the disk is idle, provides data protection during powerdowns and transportation.

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Introducing a graphics system to meet your every need, whether it's creating sophisticated presentations that integrate screens from your favorite programs — or expressing yourself with freeform drawings.



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Ordinary business graphics programs are fine as far as they go. But they are hardly the stuff of interesting business presentations.

If you need the ability to integrate and modify screens from other programs, such as Lotus 1-2-3, dBASE II®, CREATABASE, and WordStar™ — or just give free rein to your artistic side with free-form drawings — you've probably been frustated on both counts.

Now there's a business graphics system that gives you these capabilities, plus the usual line, bar, 3D bar, horizontal bar, and surface and pie charts.
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With Executive Picture Show you can create:

- free-form graphics
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- animated presentations

Presentations to keep viewers on the edge of their seats.



Not only does Executive Picture Show accept screens from other programs, it lets you integrate them into your presentation where and when you want them. Then you can add the sound, motion, and color that insures a captive audience. Dropping in your company logo or making bar graphs take form right before your viewer's eyes is easy as pressing a few keys.

Executive Picture Show allows you to use both your IBM® monochrome and color monitors during your presentation. This means you can show a spreadsheet on your monochrome monitor, while a graph or drawing is formed on your color display.

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The Executive Picture Show was designed with you and the audience in mind. Not only does it allow you to design a moving presentation, it gives your viewers a chance to respond with more than enthusiastic reviews. They can actually input their responses so the program — and you — can act on their input.

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We had the business executive in mind when we designed this tool. That's why Executive Picture Show cuts through all the "computer-ese" to simplify instruction and prompts you throughout the program. We've reduced many steps to single key commands and included a handy reference card to help you get your show on the road.

Executive Picture Show is playing at a computer store near you for just $195. If you want to preview this program, contact PCsoftware of San Diego directly for a demonstration disk and documentation priced at $30.

Requires: Graphics adapter and display
128K RAM
2 disk drives or hard disk
IBM PC or IBM XT

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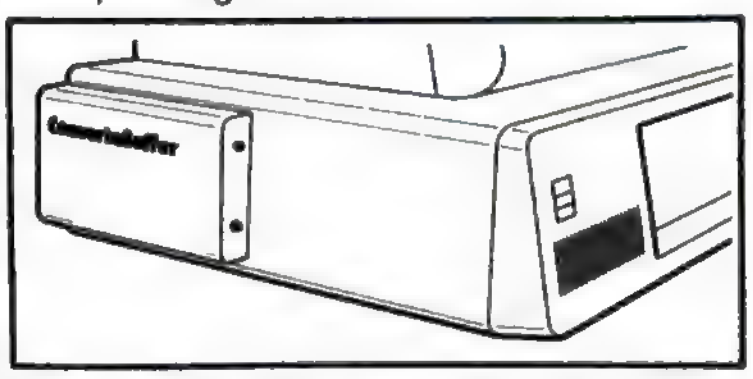
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ConvertaBuffer™

IT'S A CONVERTER. There was a time when buying a letter quality printer meant giving up graphics. Now, however, ConvertaBuffer™ gives you the best of both worlds by allowing you to print the business graphs generated by programs such as MBA and 1-2-3 on letter quality printers such as Diablo and NEC. And, the quality of these graphs are as good as those drawn by dot matrix printers such as the IBM/Epson. ConvertaBuffer translates the Epson-format graphics data output from MBA, 1-2-3, and other packages with graphics capability into the format necessary for printing on a letter quality printer.

IT'S A BUFFER. Generating graphics requires the outputting of a large amount of data to the printer. ConvertaBuffer speeds this process by receiving the data as fast as your PC can send it — 1,000 characters per second; storing up to 64K bytes of data in its built-in memory buffer; and then sending it to the printer at the printer's slower speed — 25 to 55 characters per second. This allows you to go on to other work without having to wait for the printer to finish printing.

EASY TO INSTALL. ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

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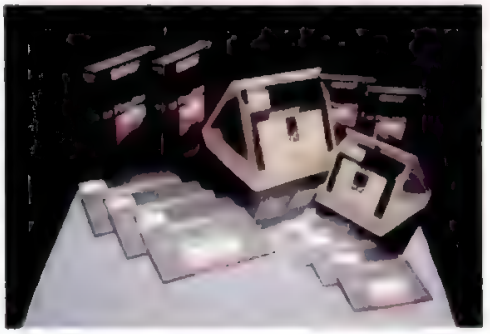
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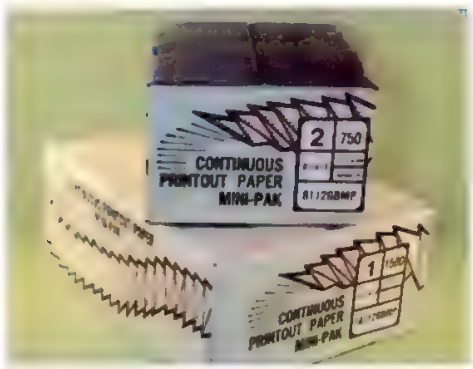
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Or that we would be called the "industry heavyweight."

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IBM

A bit of cheer for the holidays celebrating the old and the new, plus glad tidings for the future.

A Visit From St. Charlie

'Twas the night before Christmas, when all through the house
Not a keyboard was clicking, not even a Mouse.
Floppy disks were stacked by the PC with care,
In hopes that St. Charlie soon would be there.
The children were plugged in, all snug in their beds,
While visions of *Donkey Kong* jounced in their heads;
And Mamma in her WalkMan, and I at home base,
Had just settled down for an eve's interface,
When from out of the Tandons there arose such a clatter,
I sprang from my lotus to see what was the matter.
Away to the rec room I flew like a flash,
Tore open the disk drives and threw up the sash.
The glow from the pilot lights on the power-line feeder
Would put a smile on the face of an electric meter reader.
When what before my wondering eyes should blitz
But a portable PC with 16 micro bits.
The little old driver, with legs like a duck,
I knew in a moment it must be St. Chuck.
As rapid as Eagles his Columbias they came,
And he whistled and beeped and called them by name:
"Now, Epson! Now, Compaq! Now, A-S-T and Tecmar!
On, Quadram! On, PC! On, Microsoft and *WordStar*!
To the top of the work station, to the top of the wall!
Now crash away, crash away, crash away all!"
As dry floppies that before the wild hurricane fly,
When they meet with a magnet, mount to the sky,
So up to the ceiling the kilobytes flew,
With the disks full of data—and my backups too.
And then in a twinkling I suffered the view
Of a prancing and pawing in my CPU.
As I drew in my head and was turning around,
Out the serial port St. Charlie came with a bound.
He was dressed in a tux from his head to his foot,
And his bowler was tarnished with ashes and soot;
A bundle of toys he had flung on his back,
and he looked like my dealer just opening his pack.
His eyes how they twinkled! His dimples how merry!
His cheeks were like roses, his nose like a cherry.
The beard on his chin was white as an IBM shirt,
(But I think he must have drunk his dessert).
The core of an Apple he held tight in his teeth,
And smoking Ataris encircled his head like a wreath.
He had a squashed Commodore and a little Sinclair
That rattled when he shook it, like an old TV chair.
He was chubby and plump, a right jolly old elf,
And I laughed when I saw him, in spite of myself.
A wink of his eye and a twist of his head
Soon gave me to know I had nothing to dread.
He spoke not a word, but went straight to his task,
Cleaned out all the stocks and bonds, then moved to my desk,
And laid one of each toy from out of his case,
Then gave a nod, and up the chimney he raced.
He sprang to his PC, to his modem gave a whistle,
And away he flew like an electronic epistle;
But I heard him exclaim, as over the horizon he sank,
"Happy Christmas to all, I'm off to the bank!"
(With deepest apologies to Clement C. Moore)

* * *

Is home where you plug in your PC? More and more computers are finding their way out of the office and into the house, where Santa Claus (and your family, your boss, your taxman, and you) can easily find them.

In this issue of *PC Magazine*, we are pleased to offer a little taste of a new magazine with a big future: Call it a Christmas present, if you will. Our New Year's resolution, come January, 1984 will be to present a monthly expedition into the world of the PC and PC-compatible microcomputer in the home. You'll learn about education, about controlling the lights, heat, air-conditioning and alarm systems of your home from your computer, about kitchen-table word processing, and much, much more.

And, yes, January will bring the first biweekly issue of *PC Magazine*. Once a month was too seldom.

Merry Christmas, Happy Chanukah, Happy New Year, and good reading, using, and learning in 1984. —*Corey Sandler*

Illustration by Ponder Goembel



Season's Greetings

AMDEK



The STB Graphix Plus™: an affordable way to put a whole new complexion on your IBM PC or XT.™

You get color or monochrome graphics plus a parallel printer port, all in one slot.

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Graphix Plus also drives the IBM monochrome display, in graphics and high resolution text modes, and is compatible with Lotus 1-2-3™, Microsoft Flight Simulator™ and other popular software. And, Graphix Plus provides for extended text capability.

Graphix Plus also includes a lightpen interface and PC Accelerator, STB's super ram disk emulator and print spooler program.

For a graphic demonstration of how Graphix Plus can expand your personal computing capabilities, see your local dealer. For more information on the entire line of quality products, write or call us.



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Expanding Microcomputing

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CIRCLE 568 ON READER SERVICE CARD

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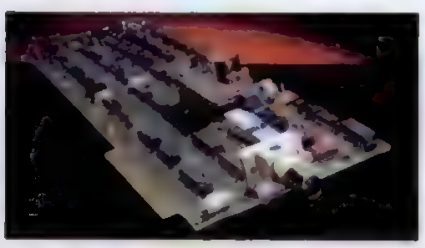


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Share and grow with PCnet from Santa Clara Systems . . . the true local area network for the IBM Personal Computer (PC) and its MS-DOS operating System. PCnet allows the sharing of hard disks, floppy disks, letter-quality printers, modems, and internal memory by all networked PCs. So you can add new dimensions of capability to your system while reducing your per station costs!

True network news

With its proprietary, on-board intelligence, PCnet permits direct communication between all PCs in your network. If one goes down, the others don't. Unlike other network products, a dedicated disk server is not necessary, saving you money. In fact, no extra hardware is required to add more stations; just one PCnet board for each and you're set. Plus, PCnet is transparent to all IBM and compatible software.



Service for thousands

You have plenty of room to grow. And, as you add more users, your peripheral resource power and memory capacity increase linearly. For all that it offers, PCnet is surprisingly easy to install. Just plug a PCnet board into an I/O slot of each IBM PC you want to include in your network. Then tap into the standard coaxial cable—offered in lengths of more than one mile with PCnet!

The extras you'll like

You'll appreciate the specialized network utilities available with PCnet. Like print spooling, multi-tasking, and file-locking. Plus the ability to communicate with IBM PC look-alikes. In addition, the Pascal Bubble™ is supported under MS DOS.

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Only Santa Clara Systems offers you worldwide support with PCnet. A full 90-day warranty. *And a complete line of hard-disk storage products tailor made for use with the PCnet,* featuring up to a ½ gigabyte of storage per PC and removable Winchester cartridges for backup.

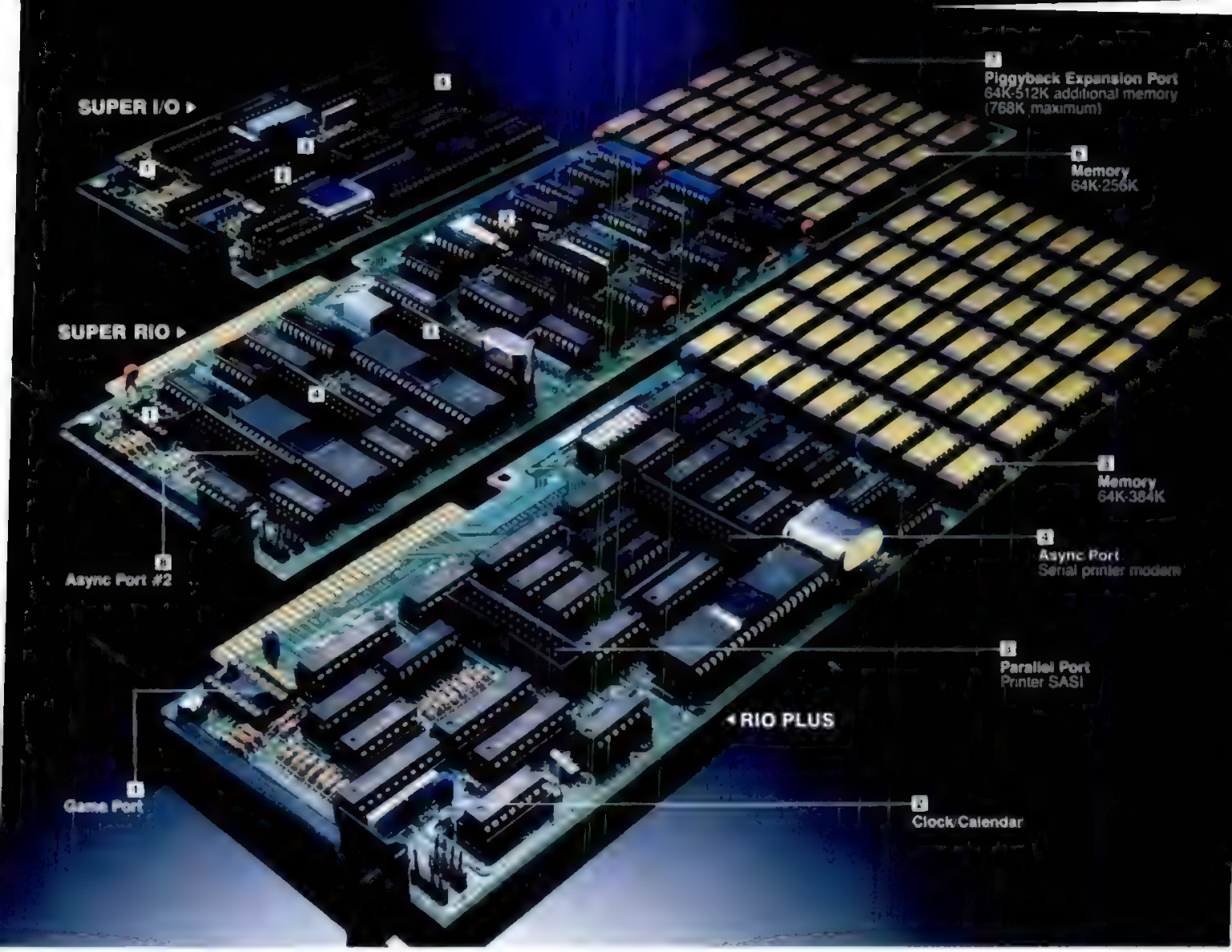
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What you get out of your IBM PC/XT depends on what you put into it.

The versatile multi-function boards from STB offer more functions and more memory.

If your personal computing applications have outgrown your personal computer's hardware, there's a smart way of expanding your system while still leaving plenty of room to grow.

The secret is the line of multi-function boards from STB.

Our SUPER RIO™ combines two asynchronous RS-232-C serial communication ports for interfacing modems, serial printers, plotters, mice, and an almost limitless list of other peripherals, a parallel I/O port for interfacing printers and hard disk controllers, a battery operated clock/calendar that remembers the date and time even when your system is turned off, a game paddle port that can use either APPLE™ or IBM™ compatible joysticks, and up to 256K of additional memory.

The STB Piggyback™ board adds up to 512K more memory onto the SUPER RIO for a total of 768K. And the pair uses only one expansion slot.

Included free with the SUPER RIO board is the PC Accelerator™, which combines printer buffering and high speed disk emulation into one easy to use program.

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As new functions and applications arise, you can count on STB Systems to provide convenient, affordable ways to adapt these innovations to your system.

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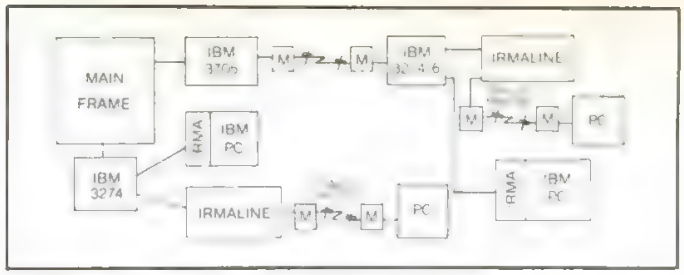
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CIRCLE 430 ON READER SERVICE CARD

Here are two beautiful ways to get small computers on line with the mainframe quickly, easily and economically—yours from TAC, home of the industry's first co-axial cable links between small computers and IBM 3270 networks.



IRMA™ is the Decision Support Interface™ that gets IBM Personal Computers and IBM PC XTs into the 3270 mainstream via direct attachment to 3274 or 3276 controllers.

IRMA™ and IRMALINE™. The TAC family connections that help small computers think big.

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IRMALINE™ does the same for remote IBM PCs, IBM PC XTs, Apple Lisas and DEC Rainbows, among others, with just a local phone call to a nearby 3270 controller.

Both can go to work literally minutes out of the box. Both provide mainframe data access, selection and storage, and data communication back to the mainframe.

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TAC

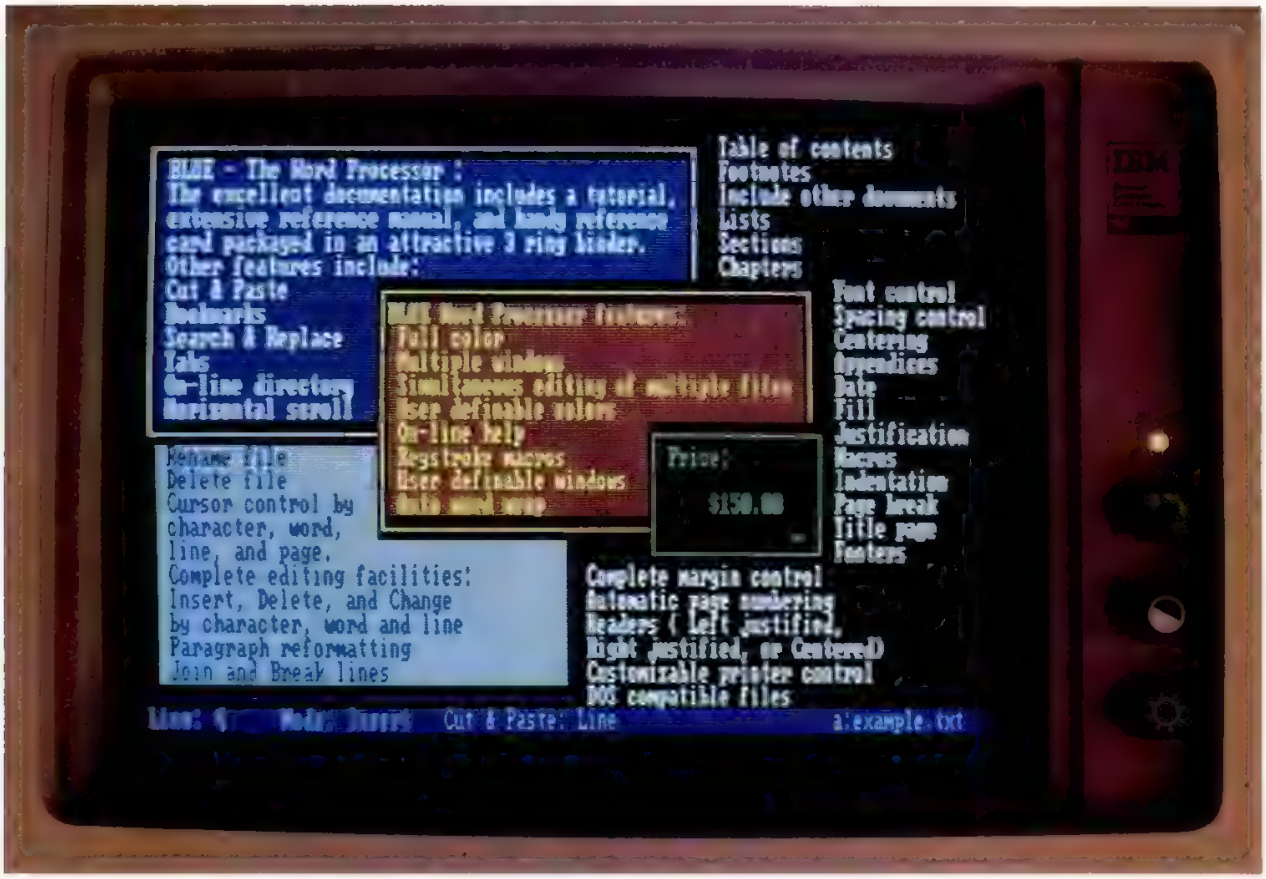
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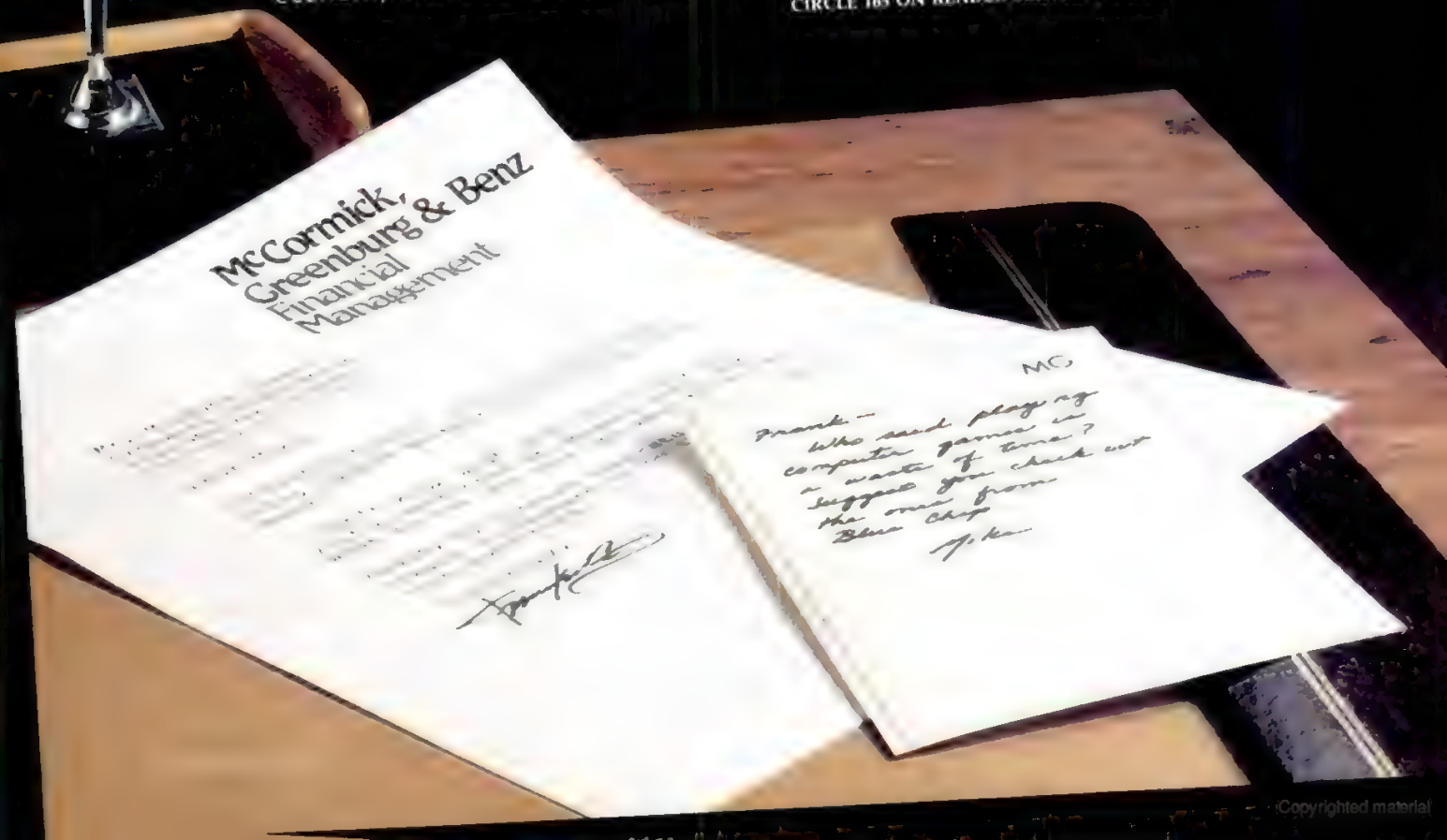
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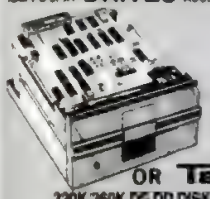
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IBM PC Interface Manual, S/W & Cable Kit		$ 300	$ 230
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VISTA IBM-PC XT 6MB Backup for Hard Disk V1200		$1549	$1049

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HAYES IBM-PC Smartmodem 1200 B	$ 599	$ 439
IBM-PC Smartcom II Software	$ 119	$ 89
Stack Chronograph (RS-232)	$ 249	$ 189
Stack Smartmodem 300 (RS-232)	$ 299	$ 225
Smartmodem 1200 (RS-232)	$ 699	$ 535
Micromodem 100 S-100 bus	$ 399	$ 275
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Apple Terminal Program	$ 100	$ 65
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NOVATION Applecat II Modem 300 BAUD	$ 395	$ 259
212 Apple Cat 1200 BAUD	$ 725	$ 559
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Cat	$ 189	$ 139
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J-Cat	$ 149	$ 104
212 Auto Cat	$ 695	$ 579
Smart Cat 103/212	$ 595	$ 415
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SSM Transcend 1 for Apple II Data Comm	$ 89	$ 69
ModemCard for the Apple II	$ 299	$ 259
Transmodem 1200 (110/300/1200)	$ 995	$ 799

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FX80 CPS		Call
MX100F/T 80 CPS w Graftrax +	$ 995	$ 630
FX100 CPS		Call
Apple II Graphics Dump Program	$ 15	$ 9
LEADING EDGE Gorilla Banana	$ 250	$ 200
OKIDATA 82A, 80 col 120 cps, Para.	$ 549	$ 449
83A, 132 col 120 cps, Para.	$ 890	$ 699
92 160 CPS 80 Col Para.	$ 699	$ 559
93 160 CPS 136 Col Para.	$1249	$ 999
2350P Pacemark, 350 cps, Para.	$2695	$2095
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ORANGE MICRO Grappler + for Apple	$ 165	$ 119
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★	12" Amber #300A	$ 210	$ 149
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★	13" Color II RGB Hi Res	$ 529	$ 430
★	13" Color III RGB (Ap II, III)	$ 479	$ 399
	DVM Color II or III to Apple II I/F	$ 199	$ 175
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Super 5	T35 Belt Drive	$ 299	$ 199
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Rana	Elite 1 163K 40 TK	$ 379	$ 249
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Microsoft 16K RAMCard for II +	$ 100	$ 60
Silicon Valley Word Handler	$ 250	$ 39
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Videx Videoterm 80 column card for II +	$ 345	$229

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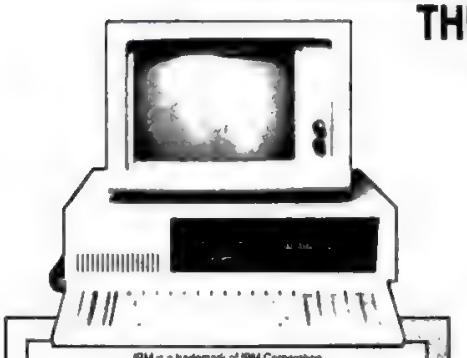
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Koala	Koala Pad ™	$ 150	$ 109
	Programmer's Guide	$ 15	$ 12
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★	Quadboard 256K 6 function	$ 595	$ 395
	Quadboard II no RAM expand to 256K	Call	Call
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	Quadboard II 256K 6 function	$ 595	$ 395
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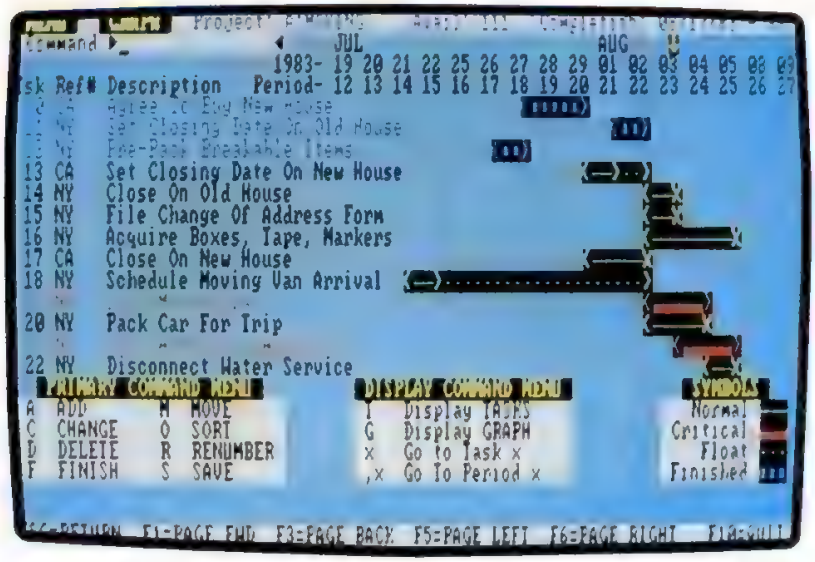
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Letters To PC

Comments on the "Chronicles"

I found the first installment of "The Norton Chronicles" quite amusing ("PC Languages: The Living And The Dead", PC, Volume 2 Number 4). Peter Norton is beginning to show a propensity for sweeping generalizations and profound pronouncements, based on a minimal understanding of his subjects. Perhaps he has begun to believe his own press releases.

It was particularly funny to read his comments on Pascal. He dismissed this language along with FORTH and BASIC in favor of his new love, C. Why, just a few short months ago Norton extolled Pascal as the greatest thing since integrated circuits. Perhaps he is forgetting that each language was designed for a specific purpose, and thus has focal weaknesses, just like humans.

Take yourself a little less seriously, Mr. Norton, and we will all find your columns more useful.

Ray Duncan
Los Angeles, California

Peter Norton replies:

Computer enthusiasts often have very strong and passionately held opinions about programming languages, which is one point I made in my column.

When I first read about a subject that I find emotionally charged, I often misunderstand what I am reading. This might be the case with Mr. Duncan. In my column I continued to extol Pascal, not dismiss it, because I still consider it the best general-purpose programming language for programming the PC. I mentioned that I now work mostly with C to reinforce the point that I'm not recommending Pascal just because it's what I happen to use.

My main point, which is well worth repeating, is that PC programmers should do their best to make wise and responsible choices of languages; too often, languages are chosen for shortsighted reasons. I hope every reader agrees that the choice of a programming language should be made intelligently.

Peter Norton's column on languages struck a responsive chord. I am currently



wrestling with the question of which language to go with for the long haul with my small computer system. For me, it comes down to a choice between C and FORTH.

While I find Norton's comments generally level-headed and to the point, I disagree with his implication that C is clearly superior to FORTH for the PC.

FORTH does have several features that I regard as defects. Norton's criticism that it is a peculiar language is certainly deserved. Two of the main problems are poor readability and the self-contained disk operating system (which does, however, enhance portability).

But Norton's statement that FORTH's execution times are mediocre compared to C's times is simply wrong. This is borne out by benchmarks in the same issue of PC. I also disagree with his implication that C allows the closest intimacy with the host computer.

I am not a FORTH fanatic, and I am rather reluctant to come down on the side of FORTH for a number of reasons. But I am driven by the scale of its demands on system resources, structured logical constructs, interactiveness, portability, expandability, linkability, speed of execution and compilation, and the total accessibility of its innards.

Although I happen to disagree with his emphasis in this case, I look forward to more of Norton's "Chronicles."

David N. Williams
Ann Arbor, Michigan

Language Talk

Thanks for giving us benchmarks in an inspired presentation ("Benchmark Programs" and "A Guide To Language Performance," PC, Volume 2 Number 4). They were flawed only by a few errors: the Pascal timings were left out, the COBOL file access program does not read back the 100 records, interpreting BASIC doesn't really outperform all other languages in floating point, and the C file access timing seems reasonable only for a hard disk. Never mind that the C file access program listing was truncated—real C programmers never read each other's code!

Nit picking aside, I found the table of performance measurements useful. Readers interested in how Pascal might have shown up on the ratings table might like to know that two Pascal Benchmarks ran faster than Lattice C: 12 seconds vs. 32 seconds for string concatenation and 10 seconds vs. 13 seconds for file access.

Letters To PC

(Pascal timings for floppy and memory disk were 39 and 7 seconds, respectively.) I used IBM Pascal and an XT for my benchmarks.

Here are some of the conclusions I reached by studying these articles and coding some of the examples in both C-86 and IBM Pascal: IBM Pascal executes as quickly as, if not more quickly than, other high level languages (which surprised me), and significant performance differences exist among C compilers (which didn't).

The message for anyone making a language decision is to ignore the dazzle and mystique a language may generally offer, and look specifically at its development productivity and application performance.

Chet Floyd
Manhattan Beach, California

Bill Machrone replies:
Lattice C really went that fast—I timed it myself. We have a pet precision worm here at the editorial offices. It lives on a diet of decimal points, leading zeroes, and parenthetical explanations. Thanks for the Pascal observations. Sorry about the truncated C listing. Our apologies to Randy Swan, who authored it.

I have been reading *PC* for about 6 months, and generally have been satisfied with its accuracy and impressed by the editing. The September issue gives me pause, though. Two errors of fact jumped out of the pages at me.

One is major: "There is no such thing as a GOTO in Pascal" (p. 121). True, Pascal discourages the GOTO command, but it is certainly part of the language.

The other is minor, but important nonetheless: "The Timex TI 99/4 and Commodore 64, for example, are both excellent targets for low end software . . ." (p. 172). Texas Instruments, not Timex, markets the TI 99/4.

Maurice A. Crouse
Memphis, Tennessee

Bill Machrone replies:
Sorry about Pascal and GOTO. It's like the numbers beyond 55 on your speedometer: They're right in front of you, but you're supposed to pretend they aren't.

The PC or the TV?

I recently joined the group of elite hackers who own an IBM PC or XT at home. Membership in this group, however, may command a high price.

Apparently, my XT is causing a lot of static on the color TV in my bedroom and on the TV of my landlady, who lives on the first floor of this two-family house. Although my wife is slightly upset about my prime-time work habits, my landlady practically threatened eviction. Even my neighbors may be experiencing disturbances, although no one has cursed at me yet.

With the proliferation of PCs and other personal computers around, I can't believe I'm the only one with this problem. But it was entirely new to the people at the local ComputerLands.

To remedy the problem, I bought a $160 line monitor and power conditioner that is also supposed to be a noise suppressor. It did clear up some of the major distortions on the televisions, but left substantial fuzz or snow.

I hope other readers who are experiencing this problem will share their solutions with me—before it's too late.

Morris W. Stemp
Forest Hills, New York

Bill Machrone replies:
Is the case on your XT tightly closed? Are all of the expansion access slot covers in place and screwed down? Are there ribbon cables running to one or more peripherals? Is the electrical ground in your home truly grounded? Is the TV antenna positioned directly over the PC, in the attic or on the roof?

Ground the machine and peripherals to a cold water pipe, replace 300-Ohm TV twinlead with 75-Ohm coaxial cable and matching transformers. Make sure the PC is far from antennas and get copper mesh covers for any unshielded cables running from the system unit to peripherals. The problem is not uncommon, just unacknowledged. If worst comes to worst, buy cable TV for your landlady. She'll love the movies.

Meltdown

The article "8087: Applications and Programming" in the September issue (PC, Volume 2 Number 4) is outstanding, and it provides plenty of food for thought. One major exception is the omission of the 8087's biggest problem area: heat. IBM supplies, in its 8087 chip set, a heat shield to wrap around the hot new addition to the family. The installation procedures do not explain how to install this shield. There is a great danger that without the shield a wire could melt down and short out, causing both danger and failure of the PC.

Robert J. Peet
Jackson, Mississippi

Bill Machrone replies:
There is no danger of wires melting and shorting because of the 8087, other than one of the minuscule bonding wires inside the chip. Such failure would be catastrophic to the chip, not your PC. The heat sink promotes greater longevity of the chip, given the abysmal air flow and cooling scheme in the PC.

Written on Parchment

Notes on the ancient and honorable ritual of *PC Magazine* initialization:

- *Thou shalt be properly outfitted for the ceremony.*

I find a hospital gown with mask suitably impressive to the novices waiting breathlessly for indoctrination.

- *Thou shalt chant, or have chanted on the stereo, devotional music to reinforce the solemnity of the occasion.*

I use Verdi's "Dies Irae" from his Requiem to enhance the rite of passage through the holy book.

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Letters To PC

• *Thou shalt greet the postman with a suitable incantation and in proper attire.*
"Oh, Wow!" is my favorite. As for the attire and additional ceremony, I have four high school students bear the sacred words into the house, repeating "Oh, Wow" to a slow march beat. Electric blue graduation gowns and silver farmer's hats with the IBM logo are de rigeur. My acolytes spray anti-static compound to clear the air; they bear aloft lemons and limes to voodoo electric spikes from reaching the magazine itself.

• *Thou shalt work in Stygian darkness.*
Computer people, like priests of old, must keep their secrets.

• *Thou shalt have thy* PC Magazine *and thyself covered by a Big Blue Shield (or equivalent).*
Check: does the magazine's hospitalization contract cover deliberate or only accidental dismemberment? For yourself, is there a clause reimbursing you for a sprained left pinky? Since it's the most common IBM PC ailment, acquired by reaching for the shift key, it may be a deductible.

• *Thou shalt support thine sacrificial altar and thineself.*
As a computer athlete, support yourself and brace the altar on which the oblation will be performed. PC is getting heavier by the month.

• *Thou shalt revel in the cover art and solemnly note the catechismal topic for the month.*
The art director appreciates this. A deferential attitude instills an inspirational mood for studying the editorial contents, sprinkled like black and white jewels in a sea of colored ads.

• *Thou shalt, with fear and trembling, remove the cover (for later framing), then genuflect over the bingo card with sterile needle at ready.*
The bingo card is, of course, the reader service card. The needle is to prick your finger and draw the bloody circle. Make certain the circle has flat segments (symbolizing low resolution graphics) so that true believers will recognize you. The bloody, broken circles will cause the computer gods to shower you with gifts.

• *Thou shalt, as a true apostle, evangelize the faith.*
Chanting "PC, PC, PC" as your mantra, dismember the magazine, page by page, saving pretty ads and extracting all articles. Read the entrails with care, and after interpreting the Delphic Oracles, make a burnt offering of the unused ads. Find a suitable reliquary for the various holy fragments (file folders or large envelopes).

• *Thou shalt read the letters column to abstract the holy truths of this missive and others like it. Then go and do likewise.*

Arthur C. Matthews
Menomonie, Wisconsin

Handicapped Computing

I am a paralyzed PC owner with limited use of my hands. Like other readers who have contributed to "PC Tutor" and "Letters To PC" in recent months, I can't press multiple keys. I asked David Rose, the developer of *ProKey*, for help.

The result is a version of *ProKey* for disabled users. It "remembers" the Ctrl, Alt, or Caps shift keys until after a subsequent key (other than shift) is pressed. Thus, any multiple key combination can be expressed with a sequential series of single keystrokes—like Ctrl-Alt-Del, the warm boot command.

One-fingered operation is integrated elegantly into a new improved *ProKey*, version 3.0, and it comes with all the advantages of a top-notch keyboard enhancer. The one-fingered mode easily turns off for normal keyboard operation, and the package is priced the same as regular *ProKey*.

Software manufacturers are often berated for their lack of support by customers who purchase their products. But at the request of a single customer, RoseSoft has extended itself in order to produce a special product that will benefit hundreds of disabled people. The company should be congratulated for this effort.

Michael Falconer
Madison, Wisconsin

We've been hearing from lots of disabled PC users who have questions to ask or information to share, and we're happy to serve as a bulletin board. Read on.—Ed.

In "PC Tutor," Dal Vordahl posed the problem of converting the Ctrl, Alt, and Shift keys to toggle action for PC users who cannot depress multiple keys ("Toggling Control Keys," PC, Volume 2 Number 1). We have created a COM program that meets this need and would like to make it available to other users. To conserve RAM, the program creates a DOS extension that modifies the ROM keyboard interrupt handler. It is ROM dependent but it is available for both the PC and the XT. It is compatible with all versions of DOS, both IBM display adapters, and all screen modes. It places a key-state cue on the screen.

Either version of the toggle-action program is available from PEK enterprises, 11 Haystack Road, Reading, MA 01867 for $49.95. We are interested in developing other special needs software.

Ernest A. Kraut
PEK Enterprises
Reading, Massachusetts

Is your magazine available in a medium for the visually impaired? Personal computers are fast becoming a fact of life in the office environment, and the IBM PC is the standard, at least here at Polaroid. It would be of great value to us, and, I am sure, to others, to be able to provide training and information to people who are unable to use your magazine in its

Letters To PC

traditional format. I would appreciate any help you could offer us in this area.

Gregory McHale
Cambridge, Massachusetts

As far as we know, a version of PC *for the visually impaired does not exist. Perhaps one of our readers can help.—Ed.*

Just One More Chance

I'm up the creek without a paddle, and I may never make it back to shore.

I'm a writer by trade. Last October I got a grant to help out with my work, and I took the cash to Computerland. An hour later, I swayed out with an IBM PC, 64K RAM, two double-sided disk drives, a monochrome display, an Epson MX80 printer, a big stack of computer paper, and *EasyWriter II*.

I was rebuilding my career for speed. A good thing, too; I needed to make back the money fast.

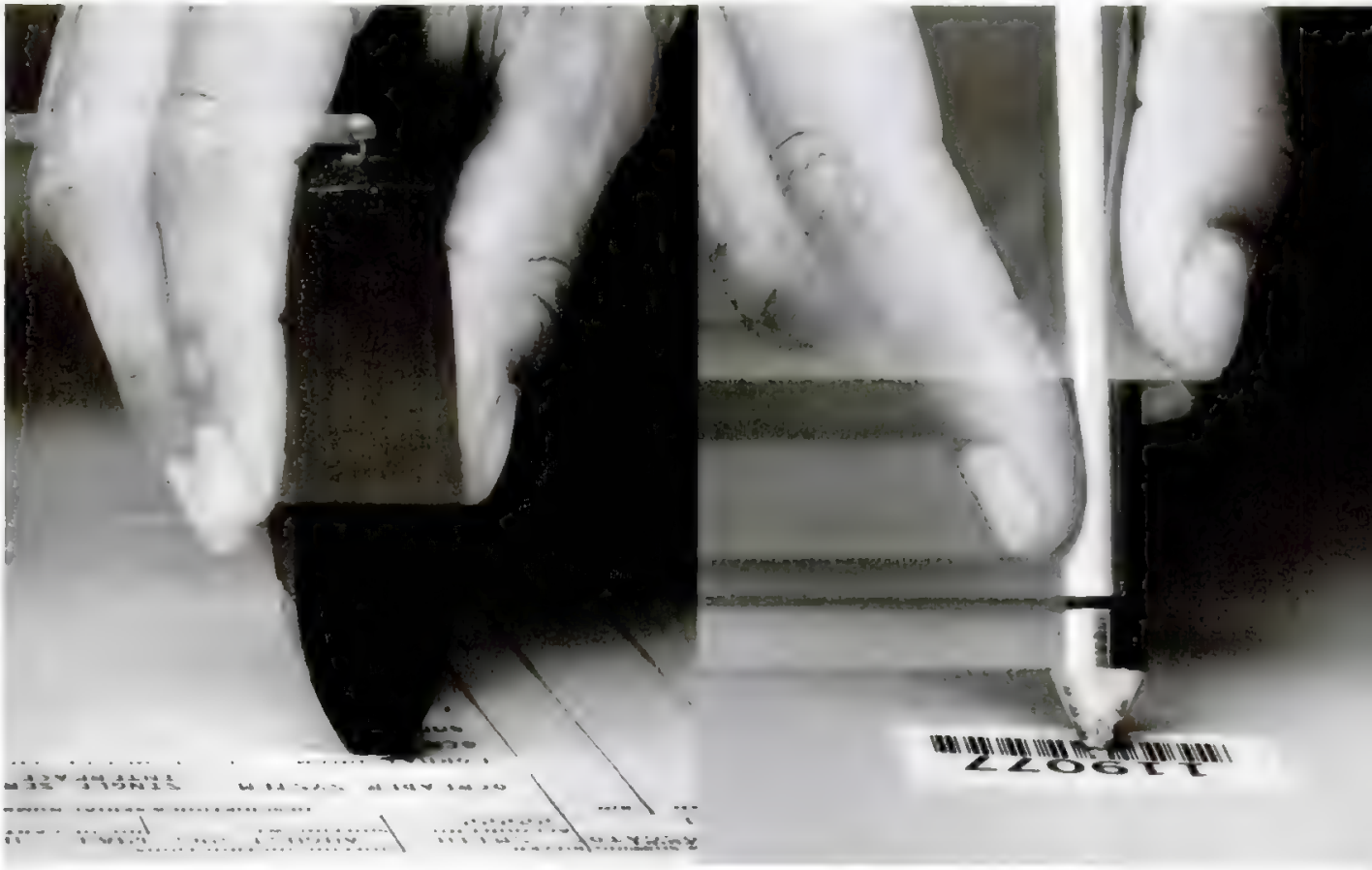
As promised, *EasyWriter II* was fast and transparent. In fact, within a few days I could see right through to its faults. Some of the commands were too complicated. A block move, for instance, required six separate strokes and crossing hands. I was a typist, not a pianist. *EasyWriter* could be easier.

That's when I opened *PC Magazine* and read about *ProKey*. "Program your own key sequences!" I had to have it.

ProKey gave *EasyWriter* wings! One push of Alt-5 now invoked a letterhead made up of 75 strokes. Under it, I was writing over 100 business letters a week, many containing a phrase I stored under Ctrl-x: "Please buy my stories; I can really use the cash."

My writing had gathered such speed that any pebble on its path struck back like a boulder. And the biggest was right under my nose: the IBM keyboard. It was noisy, ill-designed, and altogether too slow. I picked up *PC* again and read about the Keytronic KB5150 keyboard. Lightning fast and silent as a sigh. I had to have it.

You were right. The KB5150 kicked ideas into consciousness that no selectric had ever stirred. Plots and treatments gushed out through my fingertips,



Letters To PC

sped across the keyboard, and overflowed my floppies.

That's when I picked up my *PC Magazine* and read about *The Final Word*. It had a split-screen editing facility! You could edit two files at once! I had to have it.

I got *The Final Word*.

Never has so much amounted to so little. It was so freighted with formatting options and safety features that it barely stirred from its disk. It couldn't even scroll a full screen at a time. Its menus offered the cholestrol of caution and I was hungry for speed!

That's when I opened up my *PC* and read about *Xywrite II*. Superfast! Two windows you could define yourself! The Burger King of word processing! Have it your way! I could lay out my files horizontally like a club sandwich or vertically like the 10 commandments. I had to have it.

It was fast, all right, and loose—with everything I treasured about writing and aesthetics. It ripped through my RAM, booted out *ProKey*, and tomahawked my texts with tiny little ASCII 27s at the end of every line. The command line, when it chose to reveal itself, looked like a brew of alphabet soup and Legos.

What was I to do? I was stalled—but only temporarily. I opened *PC* and read the article about *Memory/Shift*. With it I could run all the programs concurrently. This was the answer! I could compare each processor in real time, assess its relative strengths and weaknesses, and use only the parts I wanted when I wanted them.

This was it. Speed was my creed. I'd run my test, pick the best, and return to the pampas of publishing with the fastest draw in town.

I had the first benchmark running. How fast could each processor jump over the quick brown fox, do a global search for the lazy dog, and *MailMerge* both in 50 seconds? Then an incredible thing happened. Everything stopped. For the first time in months there was nothing on the screen. Con Ed had finally pulled the plug. And then, from out of that horrible silence, I heard a man

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OCR-A

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JKLMNOPQR
STUVWXYZ1
23456789O
\"/-$>+<

BAR CODE

1244290

MICR

1234
5678
90⑈⑆

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Letters To PC

scream, "I'm broke!" My blood chilled when I realized it was me.

Last night I sneaked a cord into my neighbor's socket to write to you. Because I can no longer afford the postage, I will drop this confession into Boston Harbor and hope that it reaches you. Let others learn from my sorry tale. Beware: Software is infectious. Without proper supervision, it can be a terminal disease.

Tony Kahn
Arlington, Massachusetts

P.S. I was just about to unplug when I picked up PC one last time and saw the notice about your contest.

Could it be? A *new* word processor for the winner? Free? I wouldn't have to pay a cent—and there's so much more to see! Microsoft is coming out with *Multitool Word* soon. There's the 3.3 version of *WordStar* that's supposed to be faster. IUS may finally get around to putting split screens in *EasyWriter*, *Blue's* sure to update and snuff the bug in the 0 function . . . .

The hell with tomorrow—this is the future! Forget everything I said. Just give me one more chance. Please! This time I know I can make it.

Nice try, Kahn. We've seen your type before, allegedly reformed, promising to do better next time. You're as transparent as a virtual machine. Once a techno junkie always a techno junkie. However, as our own "problem staffer," Paul Somerson, reminds us, "Let he who is without a craving for the latest update bend the first diskette." We have postponed a decision on the Better Letter Contest winner ("PC Communiqués," PC, Volume 2, Number 4) until next month. Hope you can hold out—Ed.

Chacun à son Processor

I've been using Peachtree's *Magic Wand*, now called *PeachText*, for quite some time and I'm very very pleased with it. Commands are simple, easy to understand, and logical, and they require only a few keystrokes rather than odd-ball control codes. I've never had a lost file or a fatal error, and since my company writes computer books for a living, I consider that kind of performance remarkable.

WordStar, in all its versions, should be given a proper burial.

Jonathan A. Titus
Blacksburg, Virginia

To each his own word processor, and may you never have that certain sinking feeling . . .—Ed.

A Place For Everything. . .

I applaud your efforts in creating *PC Disk Magazine*. It is clearly an advance in moving the reader closer to making immediate use of the subject matter.

With all its merits, though, I have some qualms. I subscribe to PC and enjoy it very much. It contains a rich diversity of topical and technical information, and the necessary advertising to feed my insatiable appetite for IBM PC-related information. The concept of a "magazine on a disk" appealed to me at first. As I mulled over the idea, I began to see that material for the *Disk Magazine* would inevitably be gleaned from its parent publication.

I have watched the progress of *PC Tech Journal* and seen it get its share of technical articles that I once would have seen in PC. Now I fear that even more of my subject material will appear on magnetic disk rather than in print.

Lawrence Greenberg
Greenvale, New York

Our greatest fear is not having enough space to tell the world about the thousands of applications for the IBM PC. The Disk Magazine was designed to present the sort of lengthy, complex programs and utilities that could not appear in any magazine, including PC. The Tech Journal, as its name declares, describes trends and products too technical for the business and professional applications audience of PC Magazine. Come January, a new magazine from the publishers of PC will explore the vast new frontier of the use of PC computers in the home for education, entertainment, and productivity. And we still don't have enough room!—Ed.

PC for President

Are there any software packages to aid small-town politicians like myself in organizing and managing the material to run a campaign?

Nick Woodall
Rockwall, Texas

Several products that claim to help candidates along the campaign trail have come to our attention. Look for reviews in an upcoming issue of PC.—Ed.

Software and Sons

As founder of the Douglas & Sons Software Agency, I deeply resent being grouped with literary agents and stereotyped as "the pocket of ignorance between the programmer and the publisher." That quote is by Jane Isay, of Harper & Row, as reported in the article "The Softening Of Publisher's Row" (PC, Volume 2 Number 4). The article compounded the injury by discussing literary agents, almost exclusively, under the subheading "Software Agents."

With over 10 years of software development experience, I can say that I am capable of thoroughly evaluating and properly promoting any software that Harper & Row would ever consider publishing. Professionals in virtually every field from sports to dramatic arts to literature have the option of using agents who are experts in their fields to represent them and assist them in their business endeavors. Software professionals are entitled to the same, and in this I agree with Jane Isay. Having unknowledgeable agents between the programmer and publisher can be harmful. But to include all software agents in this condemnation is not only harmful but



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Textra runs on the IBM PC and compatibles, and requires PCDOS (any version), 128K, and either monitor. Textra Jr. ($50.95) requires 64K.

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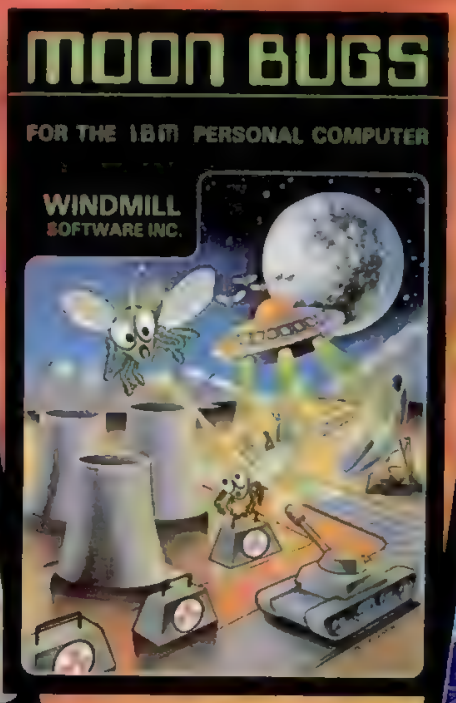
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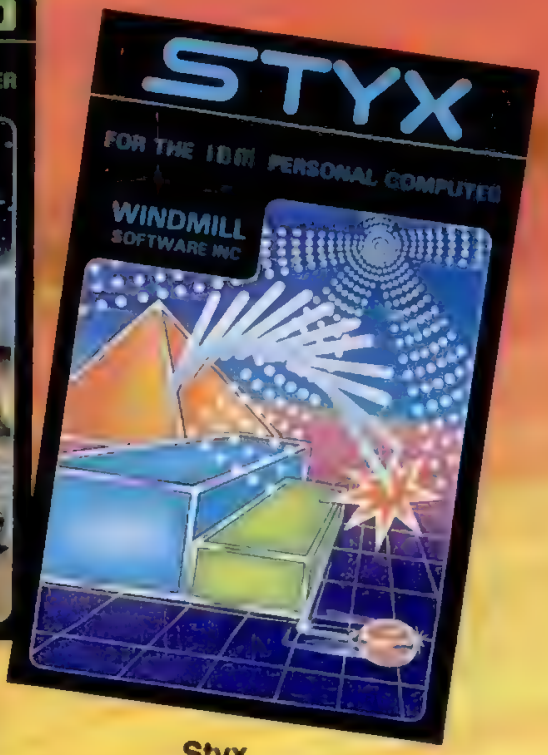
The Exterminator

Test your skill and reflexes against the hoards of bugs infesting your castle. With spray gun ready, you exterminate the gnawing termites, army ants and deadly spiders.



Moon Bugs

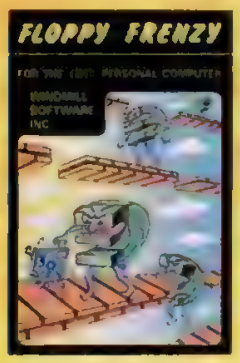
Radioactive bugs are hatching within the moon's nuclear waste zones and are approaching to consume Earth's uranium deposits required to power your nuclear reactor. You must stop them with lead oxide projectiles while dodging falling nuclear debris and indestructible energy pulsars.



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Letters To PC

against the best interests of both software professionals and publishers.

M. Douglas Robinson
Neptune, New Jersey

Periodical Confusion

I think you have an excellent magazine, and I will try in the future to write a creative letter to help you out.

In the meantime, however, maybe you could help me with a slight problem I have. My copy of your September issue seems to be defective. No matter how hard I search, I cannot seem to find the following pages: 1, 2, 3, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 42, 44, 47, 48, 49, 50, 51, 52, 53, 55, 57, 59, 60, 61, 63, 64, 65, 66, 68, 69, 70, 72, 73, 74, 75, 76, 77, 78, 83, 85, 86, 87, 88, 89, 90, 91, 93, 94, 95, 96, 97, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 117, 124, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 157, 159, 160, 163, 164, 165, 166, 169, 170, 171, 174, 175, 176, 177, 178, 179, 180, 181, 182, 185, 186, 189, 191, 192, 193, 196, 199, 201, 202, 204, 206, 207, 208, 209, 210, 211, 212, 214, 216, 217, 219, 221, 222, 223, 224, 226, 227, 229, 230, 233, 235, 236, 237, 238, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 256, 258, 259, 260, 261, 262, 263, 264, 265, 267, 270, 271, 273, 275, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 289, 290, 292, 293, 295, 300, 302, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 328, 335, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 363, 364, 369, 370, 371, 372, 373, 374, 375, 376, 378, 379, 381, 383, 385, 387, 388, 389, 390, 391, 392, 393, 394, 397, 399, 400, 401, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 424, 426, 429, 430, 432, 433, 434, 435, 437, 438, 439, 441, 442, 443, 444, 445, 446, 447, 448, 450, 451, 453, 454, 457, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 475, 481, 482, 483, 484, 485, 486, 487, 488, 491, 492, 493, 494, 497, 499, 502, 503, 504, 505, 506, 507, 508, 509, 510, 515, 517, 518, 519, 525, 526, 527, 530, 531, 532, 533, 537, 540, 541, 542, 548, 553, 556, 559, 560, 561, 564, 571, 572, 575, 579, 584, 589, 590, 591, 613, 614, 623, 643, 646, 652, 659, and 664.

Can you help?

Jon Bennet
Cleveland Heights, Ohio

Eureka! You've solved the problem. All you have to do is cut out the page numbers above (rounded scissors only), ask your mom to buy you some rubber cement, and stick the numbers to the numberless pages. Voilà! You will then have a completely numbered September issue of PC Magazine. *If you'd like to apply this solution to other issues, we'd be happy to provide the page numbers. For more on the phenomenon of disappearing pages, read on . . .*

Hey! Don't you guys talk to each other? Do you have time to read this brick after writing it?

You, Lazarus! And you, Machrone! Why don't you get together with Day and Shostak and fix those page numbers? I barely have time to read each month's PC because I have to treasure hunt for the articles and reviews. I mean really. . . . would you guys try to save a program on an unformatted disk?

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CIRCLE 136 ON READER SERVICE CARD

Letters To PC

Okay, okay. The magazine is, in general, well formatted. Once I find an article, I appreciate not having to chase it to the bottom of the brick just when it gets interesting. But why not put the page numbers in the outer, lower corner—and why not number *every* page?

And children. Children! Prithee eschew obfuscation!

William N. Allred
Towson, Maryland

Far be it from us to obfuscate intentionally. After receiving your letter (and the one preceding it), we hastened over to Shostak's office. (Mitch Shostak, for those who don't study the masthead, is PC's art director.) You won't believe what we found! Mitch, as we prefer to call him, was hard at work on a new look for our page numbers. We think you'll be pleased with his design, which can be applied to ever so many more pages, including ad pages. Mitch, of course, was also assigning new illustrations, creating new spreads and page layouts, checking color proofs, and dealing with other art director arcana outside the comprehension of us editor types.

For a moment we thought we detected a wistful look on his face. Probably a fleeting memory of Decembers gone by. We should have interpreted Mitch's wistfulness for what it was: a warning that he was about to bolt for the door. Though we missed the signal, we did manage to block his exit. There was a struggle, but we locked him in from the outside. You can be sure that more pages will be numbered. The improvement is—as we say in publishing—TK: to come.—Ed.

Compatible With Compatibles

I disagree with Thomas W. McGonegal, Sr., who is unhappy with your decision to review those computers that "offer the purchaser another choice in the marketplace" ("Letters To PC," *PC*, Volume 2 Number 4).

Might I suggest that the respected Mr. McGonegal, Sr., confine his reading to IBM brochures, thus saving himself time and money, and the rest of us an earful.

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1040 TAX SYSTEM

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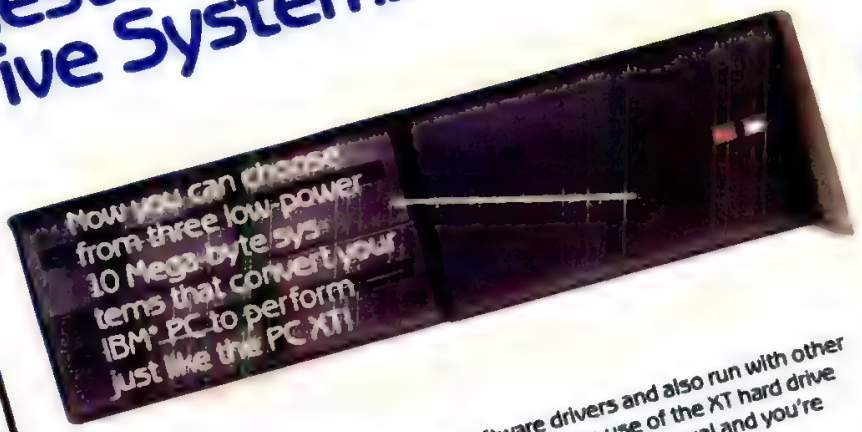
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New!
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Maynard Electronics introduces three Winchester Hard Disc Drive Systems — the only drive systems to offer you 10 Mega-bytes of formatted capacity with complete internal installation! These systems offer the user countless benefits and features: capability of booting off the hard disc; additional functions while requiring only **one** card slot in your PC; and, use of available power, thereby preventing overheating problems which have affected other drives. Handling heavyweight data was never easier.

All three systems are quality engineered and work with DOS 2.0 without any special software drivers and also run with other operating systems designed to make use of the XT hard drive system. All you need is the IBM* DOS 2.0 Manual and you're ready to run!

Each system is equipped with a low-power hard disc drive, complete software, cable, a SandStar™ Card and Hard Disc Controller Module. SandStar™ is the first family of modular peripherals created for the IBM* PC. Simple instructions for easy installation are included and all components are backed by an Unconditional One Year Parts and Labor Guarantee.

WS 1



This System is equipped with the SandStar™ Multi-function card. In addition to the Hard Disc Controller Module, you can add up to three other SandStar™ Modules while using only **one** card slot. The following modules are available: Serial Port, Parallel Port, Clock Calendar, Game Adaptor, SASI Host Adaptor and Prototyping Module

WS 2



This System is equipped with the SandStar™ Floppy Drive Controller Card. The Card can control, in addition to the Hard Disc Drive, two floppy drives mounted inside your PC and optionally two additional 5¼" or 8" drives mounted externally. This leaves three system slots for other expansion boards

WS 3



This System is equipped with the SandStar™ Memory Card. In addition to controlling the Hard Disc Drive, the Memory Card allows you to add 64K bytes to 576K bytes of memory using only one card slot

To expand your PC to perform like the PC XT, one of our Winchester Hard Disc Drive Systems is right for you. And if you have already made the wise decision to install any of Maynard's SandStar™ Cards, the SandStar™ Hard Disc Controller Module may be purchased separately.

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Letters To PC

I, for one, commend *PC Magazine* for its coverage of compatibles. To ignore them would be myopic and narrow-minded. It is due to your coverage of the variety of IBM workalike machines that I buy and read PC so regularly.

Walter Vose Jeffries
Holland Patent, New York

Database Journalism

In his article "The Database Connection" (*PC*, Volume 2 Number 2), John Helliwell referred to several database facilities for on-line searching. However, there was no mention of whether these databases referenced articles published in *PC Magazine*.

I am a systems engineer with IBM and frequently have to search through microcomputer magazines for articles about various subjects. I considered setting up my own database of magazines that I subscribe to, but a "database connection" would be more efficient and less expensive.

Wayne Caswell
San Antonio, Texas

John Helliwell replies:
Microcomputer magazines are indexed in several places.

Dialog's Microcomputer Index covers a number of magazines, including PC, beginning with January 1981. Entries include a brief abstract of the article. This database is also available through Knowledge Index, Dialog's less expensive evening and weekend service.

BRS and BRS After Dark include the DISC database, an online table of contents to the leading microcomputer journals. Its coverage starts with January 1982.

NewsNet includes the full text of a number of well-known microcomputer and office automation newsletters, such as the Seybold Reports and Amy Wohl's Advanced Office Concepts newsletter. These include thorough and blunt reviews of many new products. They can be searched fairly cheaply (to see whether there are any references to the topics you're interested in) but get more expensive when you decide to read the actual article online.

The addresses for these services are: Dialog and Knowledge Index, 3460 Hillview Ave., Palo Alto, CA 94304; BRS and BRS After Dark, 1200 Route 7, Latham NY 12110; NewsNet, 945 Haverford Rd., Bryn Mawr, PA 19010.

Ancient COBOL

Congratulations on several good articles about PC programming languages in the September issue (PC, Volume 2 Number 4). I was pleased that the authors by and large avoided the usual knee-jerk dismissal of COBOL. For some reason, the majority of professionals is crazy enough to make COBOL the world's most widely-used language, but must face constant abuse for their choice.

I vote for some good articles on this popular language to balance Peter Norton's dismissal of it because it was "designed in the dark ages. . . ." Look at the current four cylinder engines and compare their design to that of a four cylinder engine in a "dark ages" Model T Ford. Some things run full circle.

Carlile Crutcher
Louisville, Kentucky

A Tel-Expert

The article "Tapping Into Telex (PC, Volume 2 Number 3) lacked the necessary information to enable an uninformed reader to understand the use of telex.

It appears that the author, Dona Z. Meilach, was not familiar with the use of telex; perhaps an experienced telex user should have written the article.

It should be understood that the use of the personal computer for transmitting and receiving telex messages bypasses the traditional hard-copy, dedicated teleprinter, which, prior to the introduction of personal computers and word processors, was the only way telex messages could be transmitted and received.

I have been a telex subscriber for the past 10 years, using a dedicated teleprinter. The acquisition of an IBM PC allows me to access the RCA and ITT telex systems through a Hayes Smartmodem. I attempted to transmit files edited with *Volkswriter* through the RCA telex system with both *Smartcom II* and *Relay*.

Smartcom II performed well, but I was unable to print the transmitted text to my NEC-3550 printer. In using telex, it is essential that the text of every message be turned into hard copy for future file reference.

The problem I encountered with *Relay* was that although it sent the screen text to my printer, it did not send a line feed after each carriage return. Consequently, all the text appeared on one line and was unreadable.

I would be grateful if any of your readers could tell me how to solve either of these problems.

Constantine P. Georgiopoulos
New York, New York

Dona Meilach replies:
The purpose of my article was to alert PC owners to the face that global communication is possible and practical, and that software exists to facilitate it.

I made it quite clear that I am a neophyte; my objective was to show the problems I encountered and some of the answers I found. These beginning frustrations are often overlooked or forgotten by the experienced user.

As with every other aspect of computers, one learns mainly by experience and by struggling through the procedures.

Always There to Remind Me

I enjoyed Corey Sandler's review of the Compaq tremendously (PC, Volume 2 Number 1). I have only one regret: I should have read it before I bought my Compaq. In addition to the shortcomings

Letters To PC

pointed out in the article, mine ran for about 10 hours total. I had it practically on my lap from Houston to Saudi Arabia. It worked for a few hours here, and quit shortly thereafter. No CRT, no disk drive, no LED. Nothing except the fan. I now have a useless piece of electronics that constantly reminds me that I never should have bought a computer that cannot be serviced here.

Wilfred A. Shafer
Dhahran, Saudi Arabia

Memory Loss

We believe a great number of errors were made in Stephen Manes' review of our product, *Memory/Shift* ("Memory/Shift: Nine Heads Are Not Necessarily Better Than One," PC, Volume 2 Number 4). The reviewed version of *Memory/Shift*, 2.0 was not our finished product but a Gamma test version.

Manes's constructive criticism has helped us to offer an even better product to our customers. But we would like to discuss a few points about which we believe he was mistaken.

Manes admits that he never used any of the popular business programs, as our customers do. We believe that he did a disservice to your readers by limiting himself to game programs.

As we state in our advertising, *Memory/Shift* is designed to run on the IBM PC or XT, with DOS 1.1 or 2.0. As Manes points out in his review, the program does not work with other operating systems. This is still true for version 2.1.

Manes reports that he received many Parity Error 2's while using *Memory/Shift*. He may have confused a defective memory chip with a malfuncton in the program. Although the PC checks memory when booted up, this memory check is not foolproof. The symptom of a defective chip is the DOS message Parity Error 2. *Memory/Shift* did not generate this message.

Memory/Shift's capability to move data from one program to another is best expressed by the phrase, "What you see is what you get." This means anything you see on any screen can be moved to the keyboard buffer of any other pro-

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Actual INTELLICOM menu is illustrated below.
T - Terminal emulation
U - Terminal emulation with data capture.
V - Toggle local echo (off).
S - Checksum protocol file transmission.
R - Checksum protocol file reception.
A - Ascii file transmission.
B - Ascii file transmission - PTR/PTP protocol.
C - Ascii file reception - PTR/PTP protocol.
D - Toggle local display (on).
W - CompuServe Executive Terminal
X - Intel Hex file transmission
Y - Intel Hex file transmission - PTR/PTP protocol.
Z - Invoke Disk/File function menu.
E - Exit program.

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Letters To PC

gram. The net result of this action is exactly the same as if you had typed the characters by hand into the keyboard of the receiving program—but at a speed of 2,000 characters per second. Although we could have added filters to change characters in the text, we elected to keep the program as simple as possible to begin with and perhaps add powerful filtering capabilities in the future.

Memory/Shift supports two monitors. If you have a color/graphics board installed and connect a monitor, two programs can be displayed at the same time. Each of the nine programs can be assigned to show on monitor 1 or monitor 2. This capability is used by many of our customers for training purposes. Unfortunately, Manes had some hardware problems and thought that *Memory/Shift* was malfunctioning—which was not the case.

All of the existing programs sold for the IBM PC or XT were designed to run only by themselves within the PC. Consequently, if a program's authors took a few shortcuts in design, that program might have problems coexisting with other programs in *Memory/Shift*.

We are pleased to announce that our 2.1 version works with *ProKey* and the Compaq.

Perry O. Myklebost
Director of Marketing
North American Business Systems, Inc.
St. Louis, Missouri

Stephen Manes replies:
Version 2.0 of Memory/Shift, *which I reviewed in PC, was the version that North American Business Systems was selling to the public for $99 when I tested it. That's still the only version on sale as I write this three months later. I'm glad to hear the company thinks my criticism was constructive, and I'll be delighted if the announced but unavailable 2.1 version clears up the many specific difficulties I discovered in the earlier edition.*

My review discussed specific difficulties (and some downright impossibilities) involved with using WordStar, PeachText, VisiWord, SuperCalc, Time Manager, The Norton Utilities, *and at least three other "popular business programs." Those were by no means the only ones I tested with* Memory/Shift.

Regarding a "defective" PC: it is true that the Parity Error 2 message was generated by my PC — and by the other two PCs on which I tested Memory/Shift. Memory/Shift *(or its interaction with applications software) clearly caused all three PCs (all of which had at least 512K of memory) to generate the messages and hang up the machines. It's not the first time in my experience that software has caused such a problem.*

Regarding Memory/Shift's *data transfer: Because it moves screens rather than internally-stored data,* Memory/Shift *is unable to transfer nonprinting characters such as carriage returns and control characters. Instead, it may transfer their on-screen representations. And if what you see is a noncharacter graphics screen, you won't get it to move anywhere.*

Regarding the claim that the program supports two monitors: As I reported, I specifically tested that claim in the offices of PC Magazine. *An XT that functioned perfectly without* Memory/Shift *displayed Parity Error 2 messages every time I left one program on the monochrome screen, and attempted to run another on the color monitor. The RGB screen also refused to stop blinking.*

Editor's note: PC Magazine *does not perform beta (or gamma or delta) tests for software manufacturers, and it was not our understanding, nor can we find any evidence, that the version of* Memory/Shift *sent to our offices and distributed to stores was identified as a test edition. The concept of* Memory/Shift *is an exciting one, and we look forward to a perfected version from North American Business Systems or any other manufacturer.*

Past, Present, or Future?

I am writing to protest the irresponsible journalism exhibited by the publication of the article "Eye Of The Robot: The Optical PC" (PC, Volume 2 Number 3). The article gives an entirely misleading description of the state of our research in machine vision. Briefly, it presents as already accomplished things that are only planned.

The paper on which the article was based was published in the "Conference Proceedings," which were available to Peter Von Stackelberg before he wrote his article. Second, in the presentation, at which the author was present, I carefully color-coded each feature to distinguish between those that were already implemented and those that were not. The author makes no such distinction.

Neil F. Stewart
University of Montreal
Montreal, Quebec

Peter Von Stackelberg replies:
The article clearly states that a "PC based robot system capable of working on a factory floor is at least a year or two away." Dr. Stewart's paper in the conference proceedings consistently used the past and present tenses when describing his research.

The published paper has none of the coding, color or otherwise, to which Dr. Stewart refers. If my article gives an overly optimistic view of his research, it is the result of an academic paper that presents as accomplished things that are only planned.

Another BASIC Fan

Your issue on programming was extremely interesting. As a professional programmer and part-time programming instructor, I was pleased to see Paul Somerson stand up for BASIC ("In Defense Of BASIC," PC, Volume 2 Number 4).

I find BASIC the most highly developed language for commercial programming in terms of features, program development, and maintenance. As an educator, I find no difficulty in teaching stu-

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Letters

dents structured design and good programming habits using BASIC. After all, writing structured, modular programs is a programming style more than a language feature. The GOTO statement, which seems to appall the snobs, is a perfectly valid technique when used in proper context.

No language is perfect for all applications, and there is certainly room for improvement in BASIC. But the fact remains that BASIC has become the de facto standard language because of its power. Power can be used or abused; the choice belongs to the programmer.

Burks A. Smith
Shawnee Mission, Kansas

Jamming

In the beginning—the late 1950s, when computers were still hidden away in the intellectual cathedrals of the mighty—we nerdy types had to make do with another new and more accessible technology: rock and roll.

Time passed.

Now that computers have given us Promethean capabilities in just about every area of endeavor, where, we ask forlornly, is the soft- and hardware to make us true masters of our first love?

I have searched hither and yon, from the arid wastes of ComputerLand to the electronic labyrinths of CompuServe music and PC sigs, through the fetid and numberless pages of your magazine, and even unto the holy tabernacle at Boca Raton. But my question of life, the universe, and everything remains unanswered: How do I get my PC to jam with a synthesizer?

None knoweth. Are we to let the infidels of Apple and Vic, and even the outcast children of Atari, dominate the domain of computer music?

Have I missed some divine revelation, or are things really so backward that no one can recommend a program, interface, or synthesizer to run with the PC?

Travis Charbeneau
Williamsburg, Virginia

Letters

O Seeker of Knowledge, you've finally come to the right oracle. Cast your eyes on the table of contents in this issue and turn to "Making Music With the Well-Synthesized PC." Happy jamming.—Ed.

Thank-You Note

Thank you for Corey Sandler's very kind review of our program, *My Letters, Numbers, and Words*. ("From Sesame Street to Wall Street," *PC*, Volume 2 Number 5). We are extremely happy with the review, especially for the author, Elmer Larsen, because he worked for nine months on the program and deserves all the credit for its success.

Guy A. Stone
President, Stone & Associates
La Jolla, California

Nine months, eh?—Ed

Youth Wants to Know

I'm 9 years old and I'm having a great time looking through *PC*. It is helping me decide what I need for my IBM PC. I'm sending away for all kinds of information from your free reader service card.

My whole family, except for my mom, enjoys the computer. She says it's hard to learn BASIC. I know there's a new language called LOGO but I still don't think she would come upstairs and work with my IBM. Do you have any suggestions?

Sean M. Neale
Stonybrook, New York

Tell your mom that it's so simple, even an adult can do it.—Ed.

Corrections

The price for *Next Step* was incorrectly reported as $2.95 ("Is Next Step The Next Step In File Management," *PC*, Volume 2 Number 5). The correct price is $345.

The name of the author, Winn Rosch, was inadvertently omitted from "A Plenitude of Printers" (*PC*, Volume 2 Number 5).

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PC-Communiqués

A compendium of facts, news, opinions, gossip, inside intelligence, speculation, and forecasts about IBM Personal Computers.

Database: El Salvador

The American Civil Liberties Union (ACLU) is using the microcomputer as a weapon in the fight against alleged brutality by the El Salvadorean government against its citizens who are deported from the United States.

Many El Salvadoreans residing illegally in the United States claim that they will face political persecution if forced to return home, but they have had limited success in proving their contention to U.S. immigration officials. In an effort to help them, the Political Asylum Project of the ACLU's Washington, D.C. chapter will create a database including a list of 2,500 El Salvadoreans who have been deported from the U.S., and another containing the names of 50,000 people reportedly killed or imprisoned for political reasons in El Salvador. The two lists will be compared to find if a significant number of names turns up on both. If so, this data could be used as evidence to justify the El Salvadoreans' fears of facing persecution if returned home.

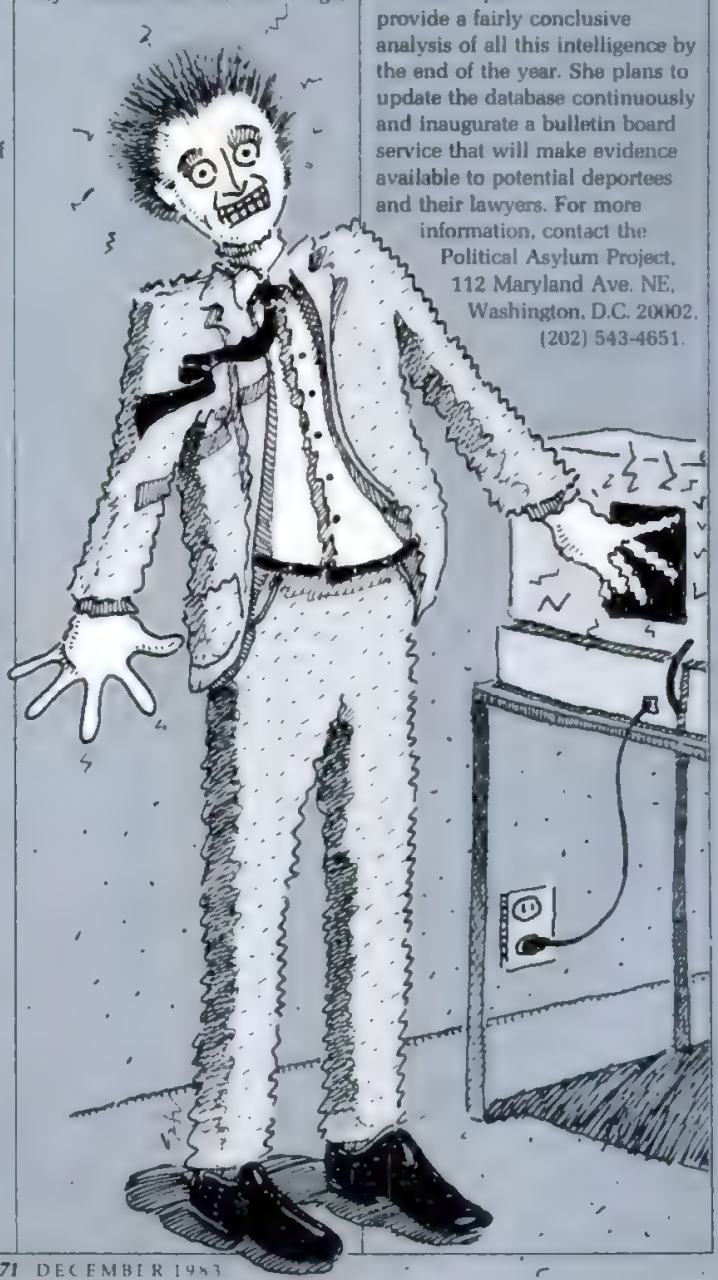
In other situations, the ACLU has argued that computerized matching of names, as used by banks, for example, to check credit ratings, is an invasion of individual privacy. In this case, explained Political Asylum Project manager Maria Boza, the information is already in the public domain, and computers are needed to deal with the complexity of the El Salvadoreans' names.

There tends to be repetition of surnames among Spanish-speaking families, so a town may contain many families with the same name. Since Catholic children are frequently named after saints, there is much duplication of first names as well. Further, the mother's maiden name, traditionally tacked on after the father's surname, is not used on all occasions. For example, a man you know as Juan Hernandez might officially be Juan Hernandez Rivera.

Distinguishing one Juan Hernandez from ten other men with the same name is a difficult proposition. To avoid overlooking correlations between names on lists of deported and persecuted El Salvadoreans, Maria Boza will catalog facts in up to 24 categories. In addition to listing first names, fathers' names, and mothers' maiden names, the database will index any available information on age, sex, social group, residence, birthplace, and political affiliation.

Maria Boza has been aided by Mark Rotenberg, director of the Public Interest Computer Association (PICA). The two have worked to apply *dBase II* to this Central American data.

Boza expects to be able to provide a fairly conclusive analysis of all this intelligence by the end of the year. She plans to update the database continuously and inaugurate a bulletin board service that will make evidence available to potential deportees and their lawyers. For more information, contact the Political Asylum Project, 112 Maryland Ave. NE, Washington, D.C. 20002, (202) 543-4651.



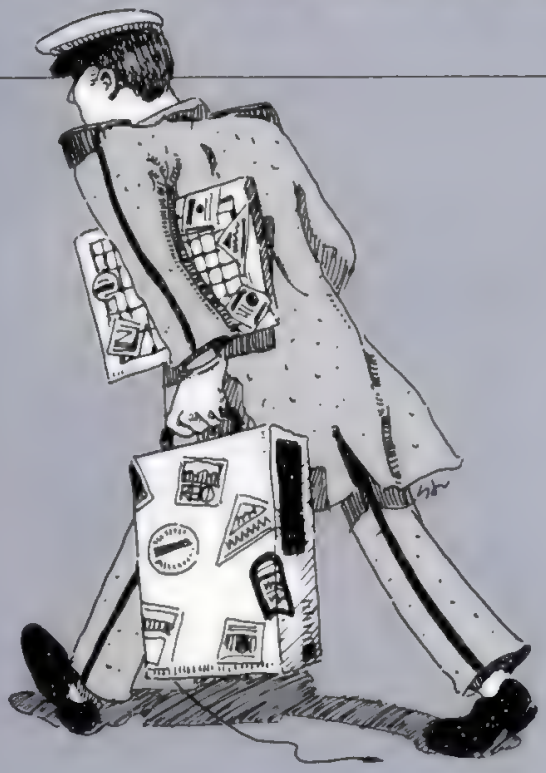
A Shocking Display

Rather than waiting to lock the barn door until the horses had already run away, IBM acted to warn users of a potential hazard before anyone (presumably) had been injured. New caution labels have been sent to owners of the IBM 5153 Color Display. The labels, to be stuck onto the bottom of the display cabinet, read: "Caution: Line voltage present with machine power switched off. Risk of electrical shock present with covers off."

The problem? On a filter unit attached to the power supply housing secured to the display cabinet, the power line and neutral wires are reversed. This can cause a shock only if a user has detached the display cabinet and the internal power supply housing and if the display is connected to a power source (even when the display is turned off).

The display already has a label cautioning users not to open up the display under any circumstances, so the new label is provided to save the skins of users who disregard the first warning. The wiring problem has been fixed on IBM color displays now in production; it did not occur in the 220-volt displays sold overseas.

PC-Communiqués



Micro Tours

In the June 1983 "PC-Communiqués," we reported that there were more computer and electronics trade shows in Asia this autumn than you could shake a joystick (or chopstick) at. We suggested calling the Japan National Tourist Organization (212) 757-5640 and the China External Trade Development Council (212) 532-7055 for information about the shows themselves. As far as we knew, however, it was up to you to make your own reservations at the Tokyo Hilton.

In time for next year, we've discovered a travel agency that arranges package tours to high-tech gatherings in Hong Kong, Taiwan, Korea, and Japan. In 1983, one tour hit seven trade shows in four countries in 16 days—whew! Recent tours included sidetrips to factories, showrooms, and research laboratories. For information on 1984's oriental trips on the electronics circuit, contact Ellen Wong at Commerce Tours International Inc., 870 Market St. #740, San Francisco, CA 94102, (415) 433-3072.

VDT Users See Red

According to two recent studies, video display terminals (VDTs), such as your PC's monochrome monitor, are not harmful to your health. A group commissioned by the National Academies of Science and Engineering spent 2 years investigating the effects of VDTs on vision but found no evidence that radiation from computer terminals causes eye damage of any kind. Although well over half the people who use VDTs are likely to complain of tired or irritated eyes, the study said this discomfort is often caused by offices with lighting unsuitable for computer use, rather than by the displays themselves. According to this report, the level of radiation from VDTs is lower than that from fluorescent lights.

The March of Dimes recently refuted claims that VDT radiation is causing birth defects. "There are so many women of childbearing age who work at or near VDTs today that some coincidental VDT-linked clusters of problem pregnancies are to be expected," says Dr. Arthur J. Salisbury, the March of Dimes' vice-president for medical services.

It is true, however, that staring for hours at the green letters on the black screen of a display can produce an unusual visual condition in which white letters on a black background seem to be pink. When you turn your gaze away from your PC toward a typewriter, for example, you may notice that the white symbols on the keyboard have taken on a rosy glow. This has happened to several PC staffers; one shouted, "It's PINK!" and threatened to quit.

If this happens to you, don't panic. It's merely a temporary trick on your visual perception, known as the McCollough effect. It rarely persists for more than a few hours and is said to be physiologically harmless. On the other hand, it's hard to believe reports on the safety of VDTs while you're seeing red.

The Pseudo Computer

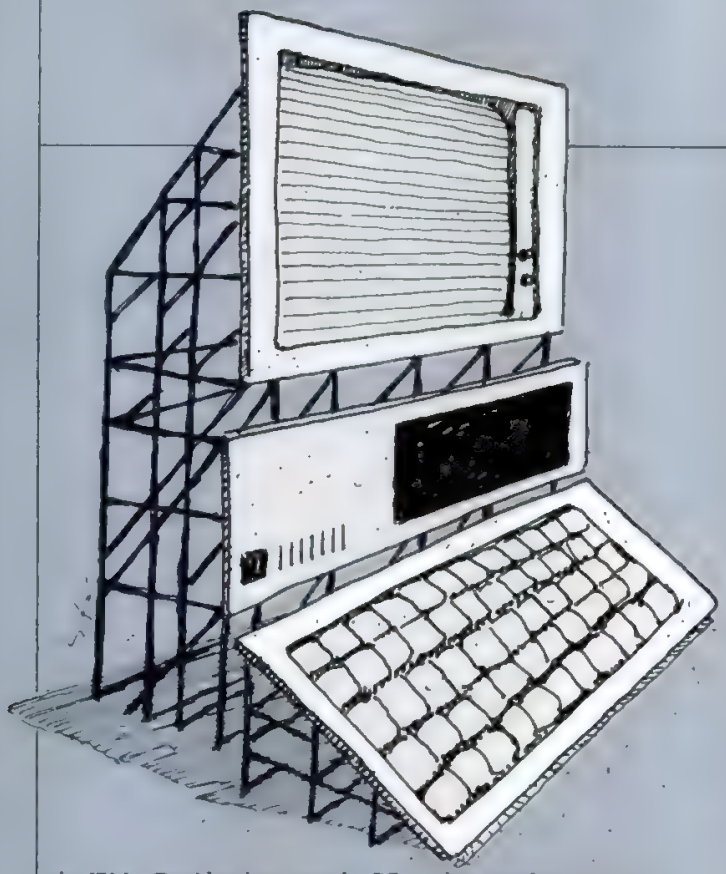
Now that personal computers have become a status symbol of the 1980s, many households will have a hard time keeping up with the microfamily next door. This holiday season, if you'd like to give visiting friends and relatives the impression that you're living the digital good life, just follow these suggestions and you can fake them out for less than 50 bucks!

If you own a VCR for your television, just hook it up to someone's real personal computer's display and record a few hours of high-tech output. Then you can place your VCR on a desk, put a small TV on top of it, and set a typewriter in front. Viola! It's a personal computer. Then keep the tapes running when guests are around. You might memorize some of the input that appears on the screen; more people will be fooled if you occasionally "finger-sync" a few lines of BASIC on the typewriter as they appear on the television.

Perhaps some entrepreneur will start selling ready-made computer videotapes. Wouldn't you like to display the same simulated computer output that appeared in your favorite movies? A cable TV channel might even be dedicated to piping runs of the trendiest new software into your home. "Designer output" could be the latest accent in interior decorating.

All of these ideas are rather upscale. They wouldn't work for those of us who must admit to not owning a television—much less a VTR. How can you give your home an IBM image when you're on a Timex budget?

Now it's possible, thanks to Box Props. That's the manufacturer of those cardboard computers you might have seen sitting on top of furniture in up-to-date stores. According to Box Props' Mike Oats, the three-piece design of the simulated computers was modeled on



the IBM—Oats' brother owned a PC, so the manufacturer just copied it. Where else can you buy the likes of a fully-equipped IBM PC for only $39.95?

Fake computers, televisions, stereos, VCRs, and simulated shelves of books are the stock in trade of Box Props. Most are used to make furniture displays look lived in, but a few have been sold to individuals as gag gifts. A school even bought a bunch of the mock keyboards to use in typing classes.

If you'd like to get some of this soft hardware—the right tools for a harmless bit of computer fraud—contact Box Props, 10 W. North Ave., Lombard, IL 60148, (312) 629-3366.

Is Computer TV Down the Tubes?

Even though a few computer-related shows have appeared on television, TV may not be ready for computers. At least, that's the assessment of Mitchell Smith of Georgia-based Piedmont Productions.

Smith and his partner, computer consultant William Bouris, are two of the many independent producers who have planned computer-related TV shows but have been unable to find sufficient financing to go into production. "Computers are still thought to have too narrow an audience for the networks," Smith says. "As a result, all the little, local computer shows are having trouble finding funding."

Smith's pet project is called "Real Time." He imagines the program as a sort of Julia Child show for computer aficionados. "You can't cook while you're watching her on TV, and if you pay attention, you'll notice that you can't really follow her recipes, either. People really listen to her because of her personality and out of interest in food," he says. Smith thinks technology buffs will have just as much fun sitting around listening to fellow PC fans chatter about their discoveries—especially if the enthusiasts are celebrities like James Michener and Marsha Norman (see "Marsha Norman: A Broadway Playwright Collaborates With The IBM PC," PC, Volume 2 Number 3).

Smith's problem is that the show he envisions would cost $30,000 to $50,000 per half-hour episode. Computer TV shows produced by universities are often funded by educational grants from the government, but "Real Time" isn't a show that intends to teach. Funding might come through corporate sponsorship. While companies like IBM and DEC would seem the logical backers for a computer TV series, supporting a show involved with their products would look more like advertising than altruism—such sponsorship would violate the bylaws of public TV.

Smith has been trying to raise money for "Real Time" for nearly a year without success. The costs of promoting the show have been overwhelming. He's beginning to sound discouraged. If he doesn't land a sponsor in another few months, he says he'll devote his energies to selling one of his other ideas. As they say in the PC biz: If at first you don't succeed, Ctrl-Alt-Del and try again.

"CUSTOMER SERVICE should be our only goal. Customer service is really hard when we can't answer the question 'What do I use one for?' "

—Philip D. Estridge
President, IBM Entry Systems Division

Classifying Classes

Everybody's getting into the act when it comes to offering computer classes. If you're looking for the right course, you could search through a score of schedules from computer stores, universities, and community colleges—as well as brochures

PC-C ués



from those groups that are oriented more toward finding you a new lover than toward getting you together with your PC. A few months ago, PC listed dozens of classes—and these were only ones that offered hands-on experience with IBM PCs (see "In Search Of Computer Training," *PC*, Volume 2 Number 3). How many thousands of computer classes are to be found from coast to coast? Who knows?

You can, however, get a good idea of the number of classes that can be found in one of America's coastal regions. The Bay Area Computing Guide lists over 500 classes in six counties surrounding San Francisco Bay. The information is extensive enough to help you choose between classes; the directory even tells what make of computer (if any) is used in each class.

This 48-page quarterly guide is available for $3 (plus $1 for postage and handling) from Computing Guide, 10601 S. De Anza Blvd. #301, Cupertino, CA 95014, (408) 973-0582.

VisiCorp Makes Room For StretchCalc

VisiCalc made personal computers into serious business tools—and made the personal computer industry a serious business. One part of this growing industry consists of companies that sell software directly inspired by *VisiCalc*. With the benefit of hindsight, some have created programs that offer more capabilities (or the same at a lower price) than the original micro-spreadsheet.

Others entered "the industry *VisiCalc* built" with symbiotic products that improve *VisiCalc*, rather than trying to improve upon it. One of these programs was Multisoft's *StretchCalc*, which added functions involving graphics, data management, and "Keysaver" commands.

VisiCorp recently announced a new version of its spreadsheet, called *VisiCalc IV*. We thought that the new features included in this version sounded suspiciously like those provided by *StretchCalc*. We guessed correctly. VisiCorp acquired the rights to *StretchCalc* and simply bundled it together with *VisiCalc* to produce a new product, aimed at competing with the new wave of "spreadbase" programs. In *VisiCalc IV*, the two programs are linked in a way that is said to be completely transparent to a user. *VisiCalc IV* is available for $250 list price; *StretchCalc* is now marketed by VisiCorp for $99 as an enhancement to earlier versions of *VisiCalc*.

We asked Bill Stevens, Multisoft's marketing vice-president, how the two software companies came to cooperate so agreeably. Surprisingly, there was no contact between VisiCorp and Multisoft until *StretchCalc* had already been developed and released. Then, at a "software success seminar" in California, Multisoft's president Bruce Schafer and VisiCorp's president Terry Opdendyk met—and wondered why they hadn't gotten acquainted sooner. In June 1983, the two companies began to explore ways of working together. The result? VisiCorp adopted *StretchCalc* into its software family and Multisoft is contracted to develop further enhancements to *VisiCalc*. (Multisoft, however, is not involved in projects related to *VisiOn*, according to Stevens.)

So how did the new *VisiCalc* acquire its roman numeral? What became of *VisiCalc II* and *VisiCalc III*? Stevens took credit for proposing the product's new name; the *IV* symbolizes the addition of *StretchCalc*'s three capabilities to the original *VisiCalc*'s function. (Our guess had been that the *IV* was selected in order to echo the *Vi* of *Visi*.) One question remains unanswered: What if presidents Schafer and Opdendyk had never met? Even *VisiCalc IV* can't solve that.

More Solutions TK

In publishing, the pair of letters *TK* is used as a placeholder to indicate that some information—an unknown name, a forgotten date—is going "to come" before an unfinished article is published.

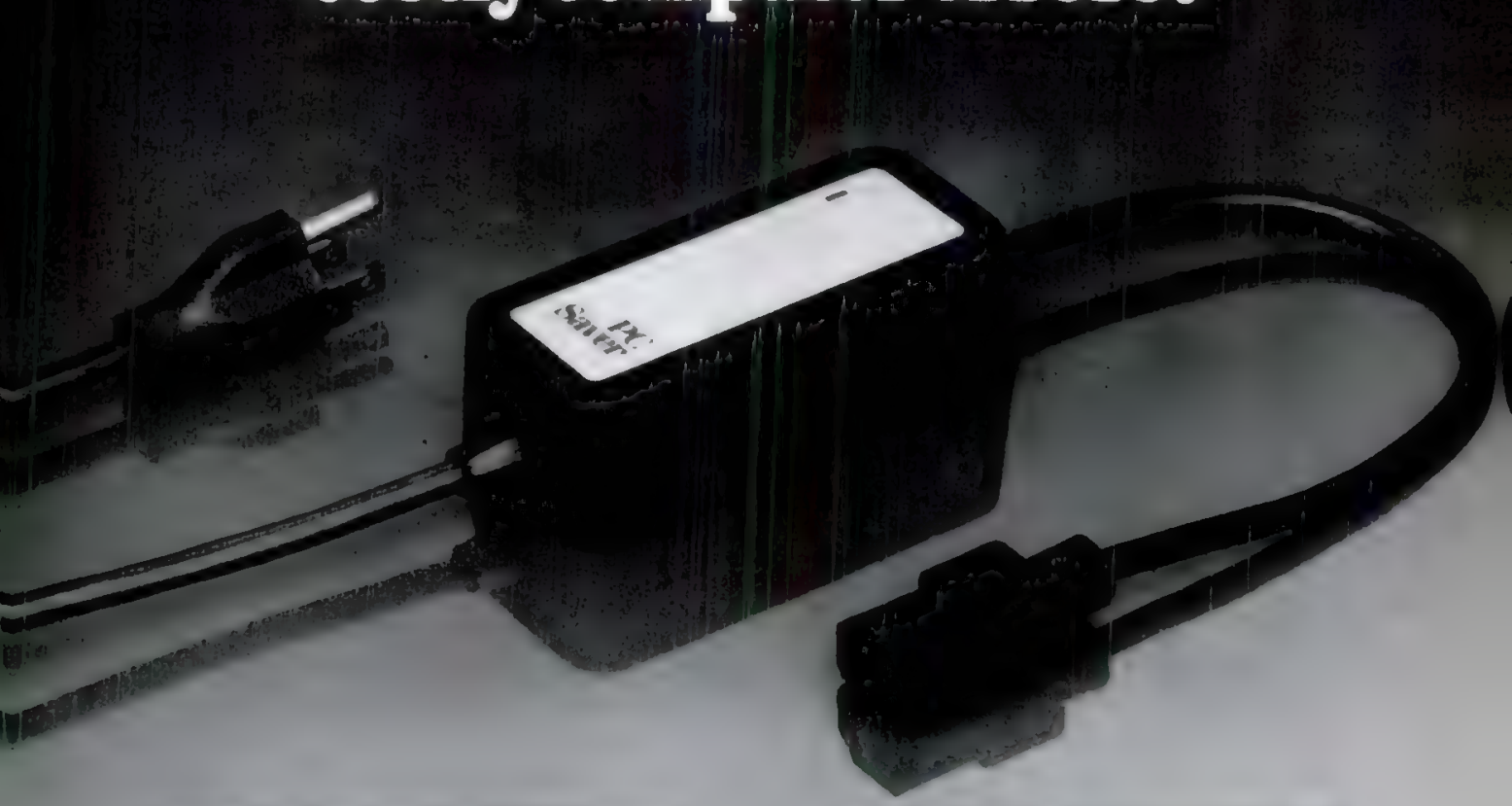
Despite this earlier definition, Software Arts, Inc. insists that the *TK* in its *TK!Solver* stands for "tool kit." (See "The Versatile Variables of *TK!Solver*," *PC*, Volume 2 Number 4.) However, it seems to us that the journalistic meaning would be just as appropriate for this program. Several products have already appeared to bring out the potential of *TK!Solver*, and there are more "to come."

Software Arts has released the third in its series of *TK!SolverPacks*, which provide ready-to-use models aimed at specific professional and educational fields. The new $100 *Introductory Science* pack provides 12 models for classroom problems in physics, chemistry, and biology.

Also, Software Arts has arranged with McGraw-Hill to create software models based on formulas in the publisher's reference books, which are widely used in the technical, engineering, and business professions.

TK!SATN, Software Arts' bimonthly, 16-page newsletter for *TK!Solver* users, includes tutorials on using the program for different applications and a guide to software products that can be used in conjunction with this program. Subscriptions cost $30 for 6 issues or $50 for 12 from *TK!SATN* Subscriptions, P.O. Box 100, Newton, MA 02162.

The PC Saver Line Cord prevents costly computer errors.



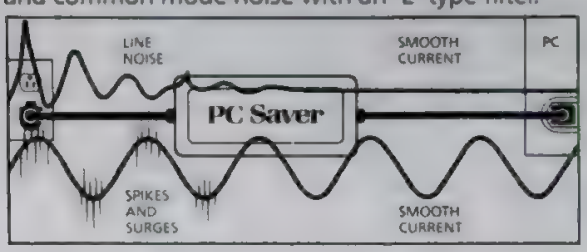
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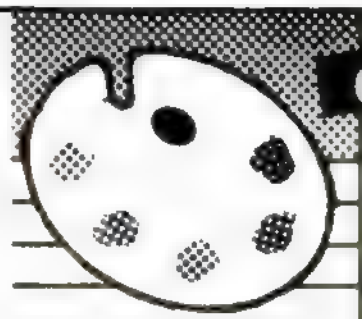
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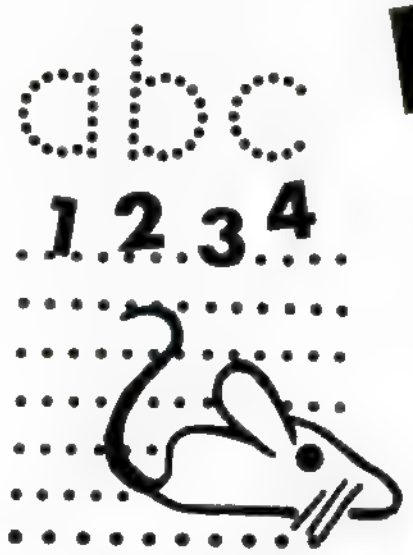
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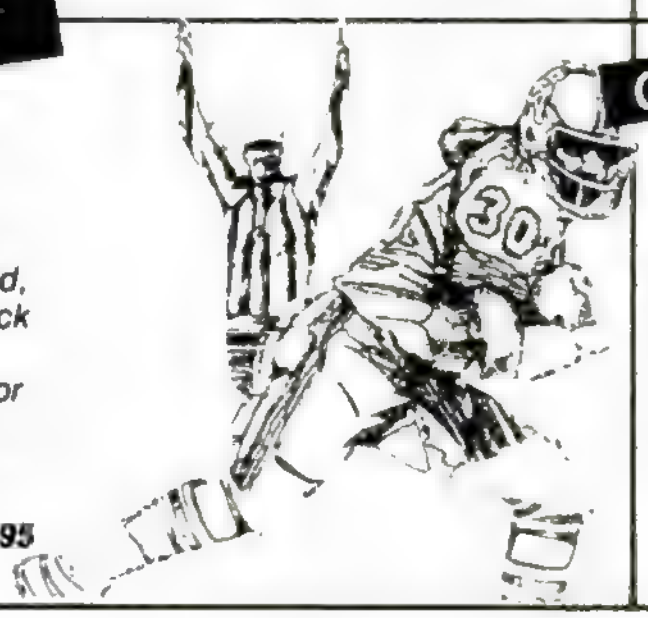
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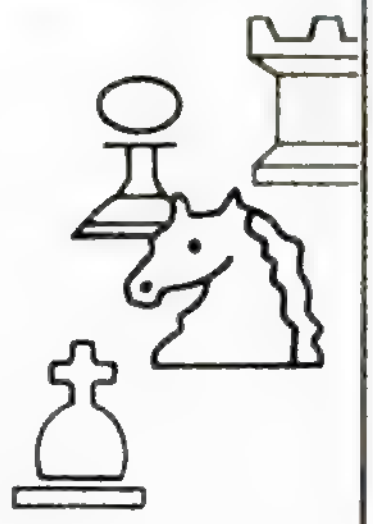
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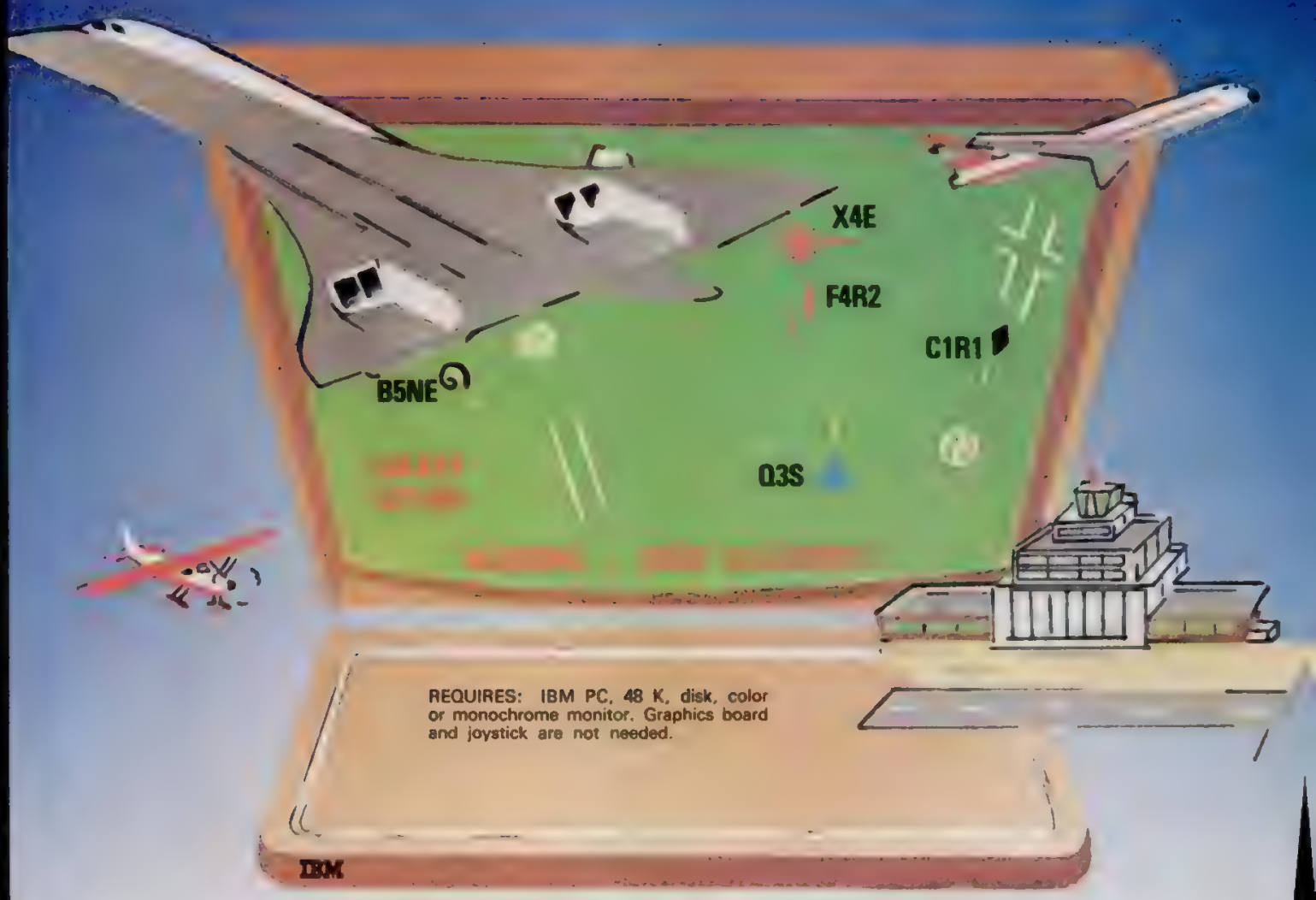
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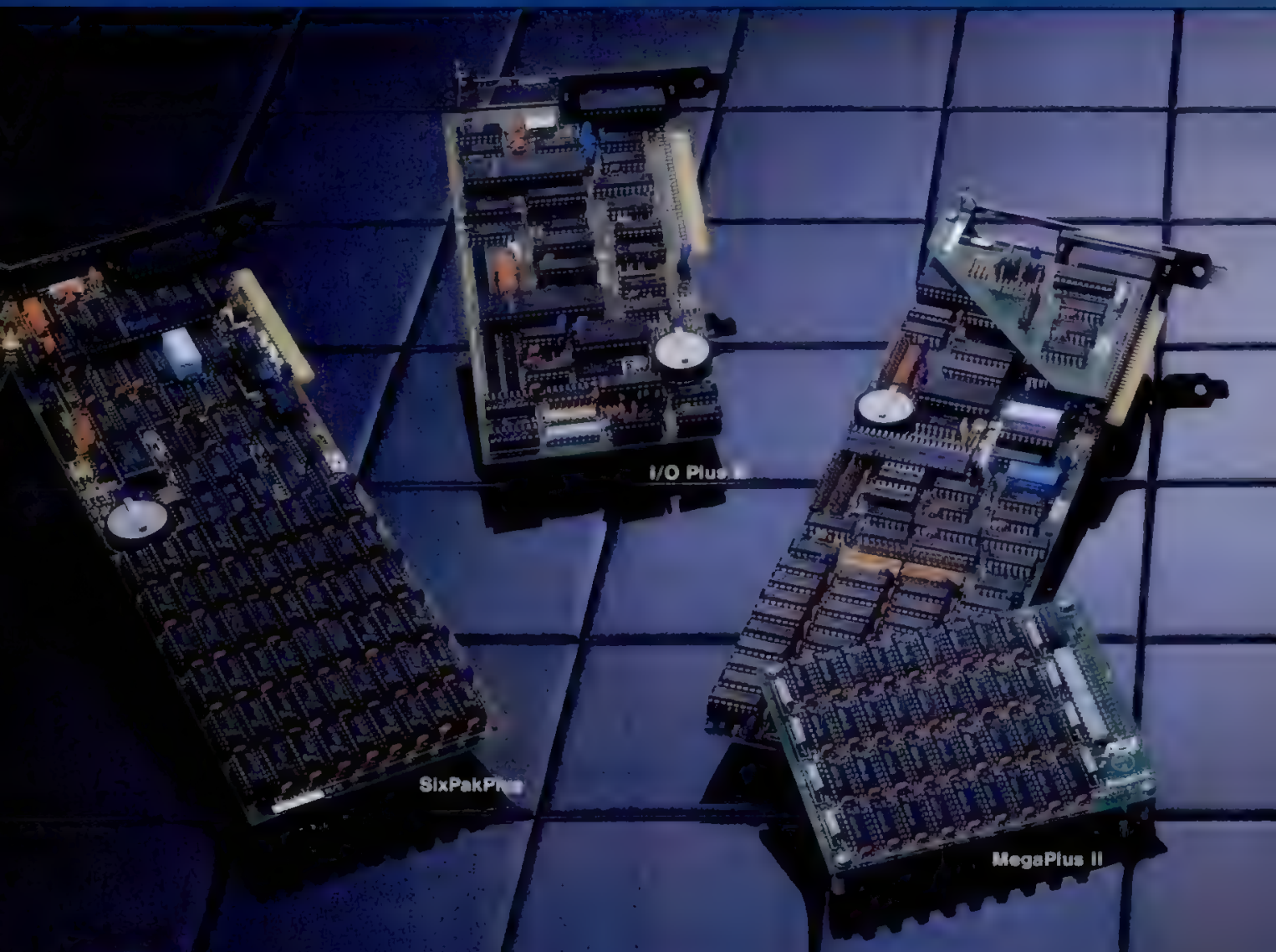
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MegaPlus II	X	X	X	X	X	X
I/O Plus II		X	X	X	X	
ComboPlus	X	X		X	X	
MP Expansion	X					

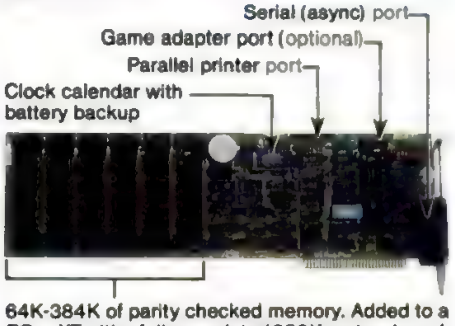
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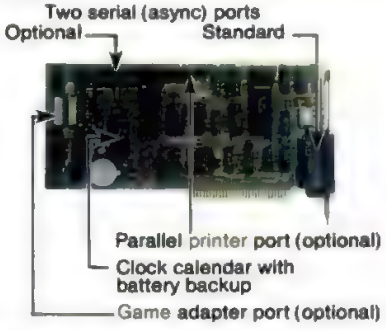


SixPakPlus™:

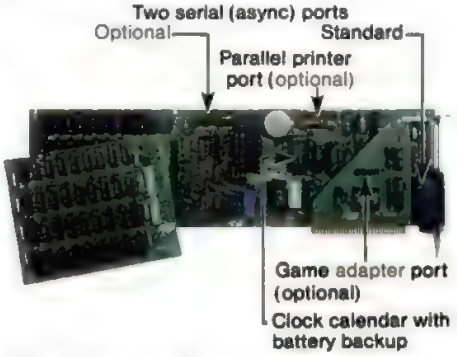


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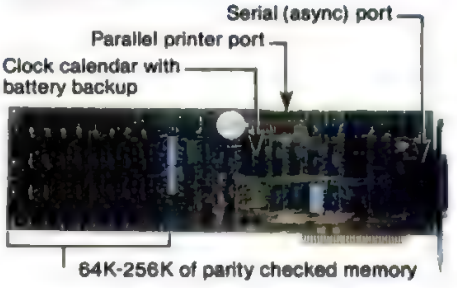


MegaPlus II™:

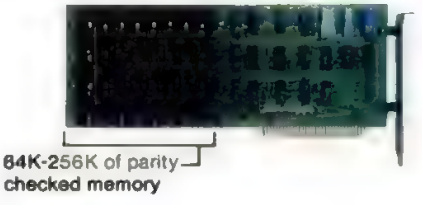


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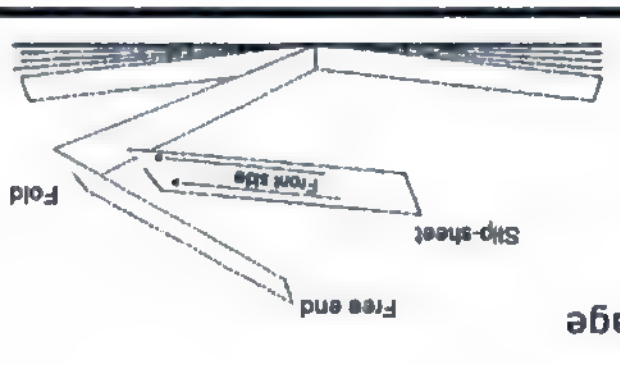
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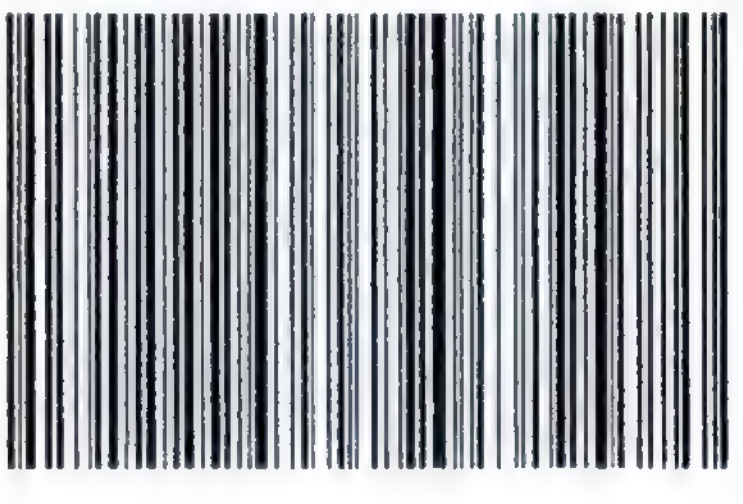
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4. Close the page and slip-sheet
3. Slice the folded edge
2. Arrow pointing to the fold
1. Front side touching the free page

Folded edge of the page

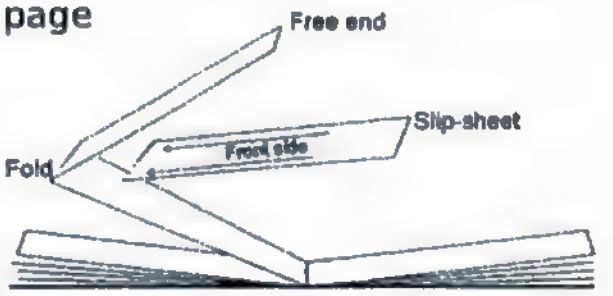


Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
    1. Front side touching the free page
    2. Insert this sheet with
        1. Front side touching the free page

Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
    1. Front side touching the free page
    2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Inverted Back

1. Follow instructions on the other side

GbsSlipBack-0018

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1. Follow instructions on the other side

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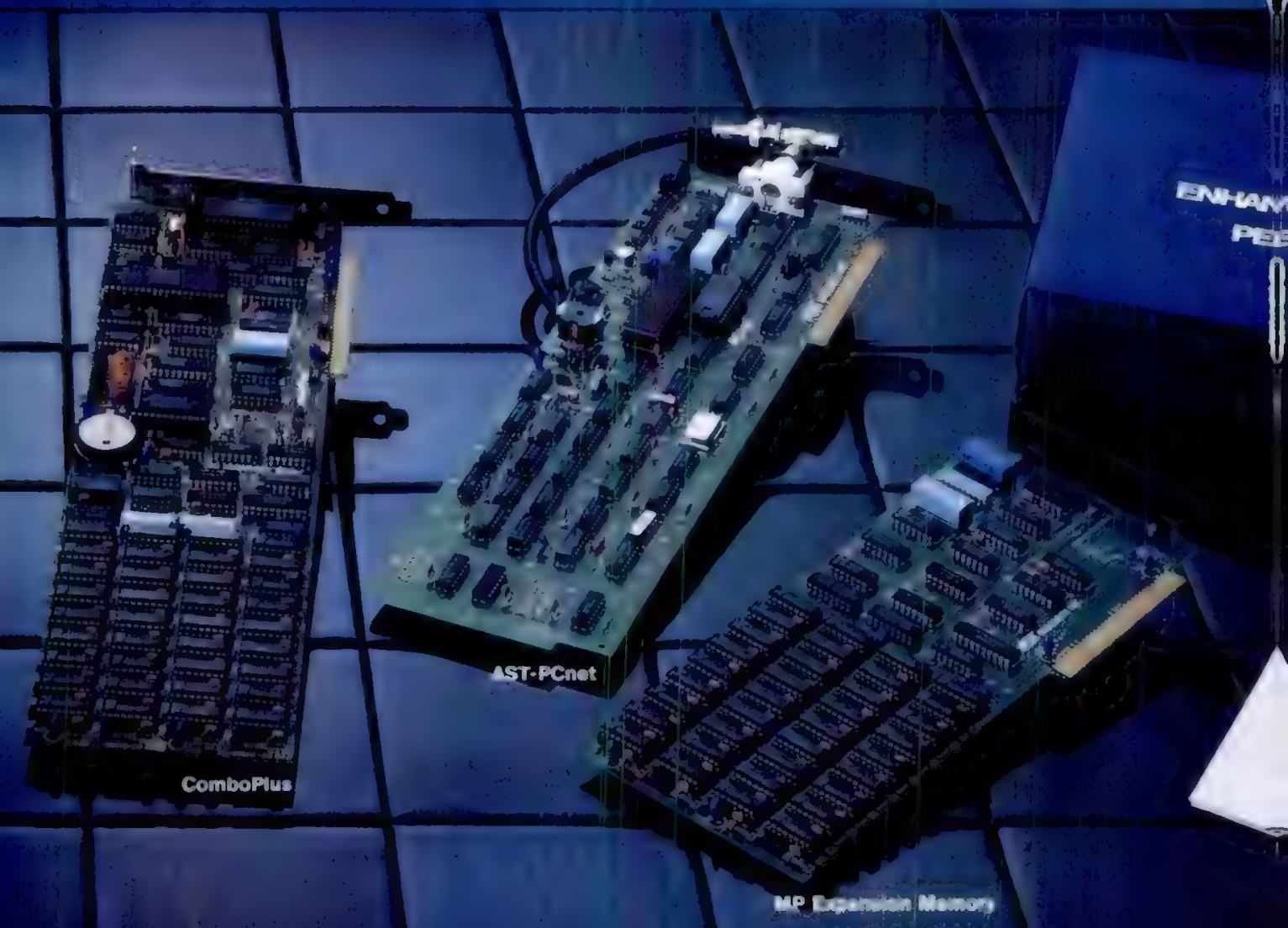
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In DOS 2.0 the file attribute is used to categorize and control the entries in each disk's directory. Norton explains how it works.

File Attributes In DOS 2.0

In my second column [see "Volume Labels in DOS 2.0 (And More Reasons to Expect DOS 2.1)," *PC*, Volume 2 Number 5], we explored a new feature of DOS 2.0, volume labels on disks. A disk label, you'll recall, is a new kind of entry in a disk's directory, which is used only to identify the name of the disk. What makes these special label directory entries possible is something known as a "file attribute." In this column, we'll take a closer look at what file attributes are and how they are used.

Each disk has a directory where DOS keeps a record of all the files that are stored on the disk. Whenever you put a new file onto a disk, DOS creates a new entry in the disk's directory. You see a list of these directory entries when you use the DIR command to ask DOS to show you a listing of all the entries in the directory. For example, if you execute a DIR command on a newly formatted DOS system diskette, you see one file listed, like this:

```
COMMAND COM 17664 3-08-83 12:00p
```

With the DIR command, you can learn quite a few things about each of the files on a disk. DIR shows you the name of the file, both the ordinary filename part (COMMAND in the example) and the filename extension (COM in the example). The DIR command also tells you the size of the file (17,664 bytes in this case), and the date and time at which the file was created or last changed.

This information is stored in the file's directory entry, but this isn't all that is stored there. DOS keeps other information about the files on a disk, but conceals it from prying eyes. One piece of this concealed information is a single byte known as the file attribute. Each directory entry has its own file attribute byte.

The file attribute is used by DOS to categorize and control the entries in each disk's directory. This attribute makes it possible for a disk to have a label and subdirectories in addition to the main, or root, directory that each disk must have.

How the File Attribute Works

The file attribute byte, like all bytes, is made up of 8 bits. Each bit is used as an independent signal that specifies which category the directory entry belongs to. Here's a list of what each of these bits signals:

0 Read-only
1 Hidden file
2 System file
3 Volume label
4 Subdirectory
5 Archive bit
6 (not used)
7 (not used)

Before DOS 2.0, the only bits that were used in the attribute byte were bits 1 and 2, which controlled the hidden and system

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4. A Clock-Calendar with battery backup, featuring an easily replaceable Lithium battery and a quartz-controlled timebase for a high degree of accuracy.

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DOS DOESN'T recognize any arbitrary combination of attribute bits.

attributes, respectively. The other six are new to DOS 2.0. The last 2 bits are available for any exotic options that may arise in future versions of DOS.

An ordinary file, the sort that we usually work with when we use our disks, has all these bits turned off. When a diskette is formatted as a DOS system diskette, two hidden files are stored on it. These files have both the hidden attribute and the system attribute bits set. For the most part, no other files have either of these bits turned on.

If bit 0 is set, the file is marked as read-only, which means that we are forbidden to either change or delete that file. Read-only files are protected against being modified in any way. DOS provides services that allow programs to specify files as read-only or not.

If bit 3 is set, the directory entry is the disk's volume label entry. The volume label directory entry is used to give the disk a name, up to 11 characters long. The 11-character volume name replaces the combined 8-character filename and the 3-character filename extension. Unlike a file, the volume label directory entry isn't a particular size since there isn't any data stored in a label. However, a label entry does have a date and time set to mark when the disk label was created.

If bit 4 is set, the directory entry is a subdirectory. A subdirectory has a name, just like an ordinary file, and a creation date and time. A subdirectory also takes up disk space since it needs a place to keep its own list of directory entries. In many respects a subdirectory is just like a file, but DOS treats subdirectories specially since, like the root directory, they hold file entries and, like an ordinary file, they take up space on the disk. In a future column of "The Norton Chronicles" I'll look into some of the aspects of subdirectories that make them so interesting.

Bit 5 is called the archive bit; it is used in connection with the IBM fixed disk system. When we have files on a diskette, it is relatively easy to make backup copies of the files. But on a 10-megabyte hard disk, making a backup copy isn't practical. To simplify this task, DOS uses bit 5 to distinguish which files have been changed since the last time a copy was made using the BACKUP utility. With bit 5, you can make backup copies of only the newly changed files. Whenever you modify a file, this bit is set to show the file has been changed; whenever you backup a file, this bit is set to indicate that a backup file has been made.

While each of these attribute bits is defined as a distinct item, none of them acts completely independently. DOS doesn't recognize any arbitrary combination of attribute bits. For example, if the label bit is set, the other bits are ignored. If the subdirectory bit is set, the read-only bit will be ignored; setting the read-only bit on a subdirectory doesn't prevent you from changing the subdirectory by adding files. At least, that is the way that DOS 2.0 currently works. As far as I know, no official definition that spells out the exact rules for treating attributes exists. It is possible that a future version of DOS will start working with read-only subdirectories or hidden volume labels.

The CHKDSK Command

There are many more interesting things to discover about file attributes, but most of them will have to be put off for future columns. Before finishing, though, here's one more interesting point about volume labels and hidden files.

When you use the CHKDSK command to check a disk, it reports the number of files and the number of hidden files on the disk. Before DOS 2.0, a diskette would either have two hidden files (which are on all DOS system disks), or no hidden files at all. But now, with DOS 2.0, CHKDSK might report that a disk has one or three hidden files. Where does this odd number of hidden files come from?

It comes from the volume label on the disk. Although a volume label, strictly speaking, isn't a hidden file, the CHKDSK command reports the label as a hidden file. This is reasonable enough, since the label does occupy a space in the directory, and it's nice to have CHKDSK report all the directory entries. You can quibble that the label isn't really a file, let alone a hidden file, but that's a minor point.

Because a disk can have one label on it and might have the two hidden files that are used by DOS on system disks, it is possible for CHKDSK to report any number of hidden files, from none to three. Figure 1 is a simple table that indicates what the number of hidden files means about the disk.

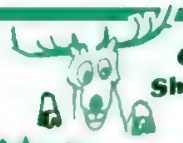
You can use it to help unravel some of the minor mysteries about disks on your IBM PC. */PC*

Figure 1: This table tells you what the number of files means about a disk in DOS 2.0.

Number of hidden files	Is the disk labeled?	Is the disk a DOS system disk?
0	No	No
1	Yes	No
2	No	Yes
3	Yes	Yes

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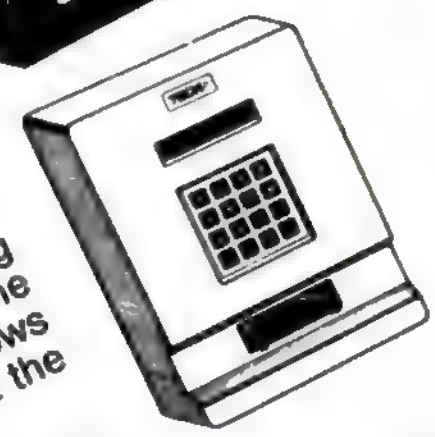
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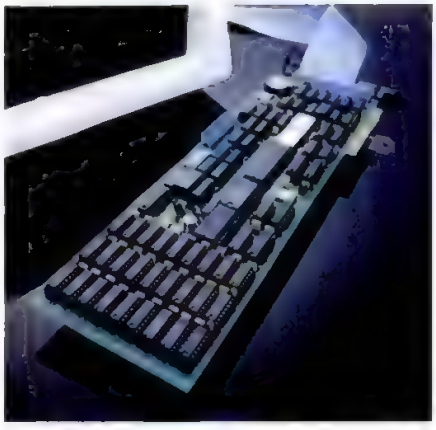
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CIRCLE 213 ON READER SERVICE CARD

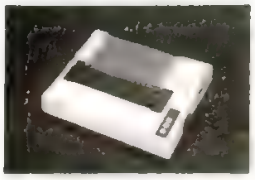
The Right Stuff...at the Right Price

Dot Matrix Printers

There've been some big changes in IBM PC printer compatability. Okidata's new Plug-n-Play ROMs (see below) make a Microline 92 or 93 fully compatible with PC screen graphics. We expect that other printer manufacturers will offer similar upgrades shortly.

EPSON

FX, RX & MX



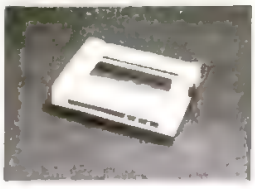
The **FX-80** (160 cps) has a correspondence font, 10, 12 & 17 cpi, italics, double-strike/width/emphasis & dot graphics, plus a 2K buffer. Friction & pin feed is standard; the adjustable tractor is optional & cost extra. The **FX-100** is the 136 column version & includes the adjustable tractor.

The **RX-80** & **RX-80 F/T** (100 cps) are upgraded versions of the MX Series.

RX-80	**$389.88**
RX-80 F/T	**$499.88**
MX-100	**$659.88**
FX-80	**$569.88**
FX-80 Tractor	**$39.88**
FX-100	**$749.88**

C. ITOH

Prowriter



C. Itoh's **Prowriter** has speed (120 cps), a buffer (1.5K), 10, 12, & 16 cpi (plus a proportional font with correspondance quality) and dot graphics (160x144 dpi). One of our biggest sellers. The **Prowriter 2** has the same specs, but in a 136 column format.

Prowriter	**$389.88**
Prowriter 2	**$719.88**

STAR MICRONICS

Gemini 10X/15
Delta 10/15



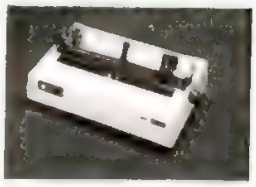
The **Gemini 10X** (120 cps) features 10, 12, 17 cpi, italics, a correspondance font, 120 x 144 dpi graphics matrix & a 1K buffer. The **Gemini 10X** comes with friction/tractor feed & uses plain spool ribbons. The **Gemini 15** is the 132 column version, & it has a proportional font.

Star's **Delta 10** features both parallel **and** serial interfaces, 160 cps print speed, an 8K buffer, plus the standard fonts (10, 12 & 17 cpi), dot graphics, friction/tractor feed and spool ribbons. The **Delta 15** is a 136 column version.

Gemini 10X	**$309.88**
Gemini 15	**$459.88**
Delta 10	**$529.88**
Delta 15	**$CALL**

OKIDATA

Microline Series



The Microline 92 (80 col) & **93** (132 col) are ideal for word processing. They offer a 160 cps draft mode, a 40 cps correspondance mode, 10, 12 & 17 cpi (w/double-width), pin/friction feed (tractor is optional on the **92**) & dot-addressable graphics (120 x 144). Centronics parallel interface is standard; the serial (RS-232C) interface is optional.

A new PROM called **PC Plug-n-Play** turns a **92** or a **93** into an IBM printer, with full screen dump capabilities. You will sacrafice a few features (like 12 cpi) but the PROMs are worth it if total compatibility is your goal.

The **Microline 82A** (80 col) & **83A** (132 col) are data crunchers, period. They print 120 cps, at 10 & 16 cpi (5/8 double-width). Dot-addressable graphics are optional.

The **Microline 84** (132 col) is the Step 2 version, featuring 200 cps at 10, 12, & 17 cpi (w/double-width), all with a correspondance mode & dot addressable graphics. Parallel or serial (RS-232C) interfaces available.

Microline 82A	**$389.88**
82A/92 Tractor	**$59.88**
Roll Paper Holder	**$49.88**
Microline 83A	**$599.88**
82A/83A Okigraph 1 Graphics ROM	**$49.88**
Microline 92	**$459.88**
Microline 93	**$759.88**
92/93 IBM-PC Plug-n-Play Graphics ROM	**$49.88**
92/93 RS-232C Interface	**$99.88**
Microline 84	**$1029.88**
w/RS-232C Interface	**$1139.88**

TOSHIBA

P1350

An exceptional printer that produces the best near-letter quality we've ever seen. The **P1350** prints at 192 cps (100 cps in near-letter quality), & features 132 columns, 10 & 12 cpi (plus double-width) & a near-letter quality font with proportional spacing. It has all the sub/superscripting features you'd expect, plus dot graphics (180 x 180 dpi). Parallel or RS-232C interface (specify).

P1350	**$1759.88**

MANNESMANN TALLY

MT-160 L
MT-180 L
Spirit



The **MT-160 L** (160 cps) is a sharp printer. The 10, 12, 17 & 20 cpi, plus correspondance font, makes the **MT-160 L** very versatile. It has both parallel & serial (RS-232C) interfaces, and the menu-driven installation from the control panel is easy to use. Friction and adjustable tractor feed are standard issue. The **MT-180 L** is the 136 column version.

The **Spirit** (80 cps) is Tally's new, low cost draft printer. It has 10, 12 & 17 cpi fonts, friction & adjustable tractor feed, and a unique square-wire printhead that makes even draft printing a pleasure.

MT-160 L	**$649.88**
MT-180 L	**$849.88**
MT-Spirit	**$329.88**

Other Dot Matrix Printers,

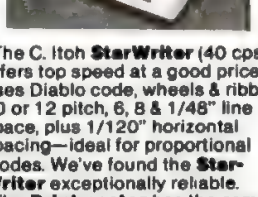
Anadex	
DP-9501	**$1189.88**
DP-9620	**$1259.88**
DP-9625	**$1369.88**
WP-6000	**$2279.88**
DIABLO	
Series 32	**CALL**
IDS	
Prism 80	**$1079.88**
w/4-color	**$1439.88**
Prism 132	**$1239.88**
w/4-color	**$1669.88**
MicroPrism	**$529.88**
Inforunner	
Riteman	**$349.88**

Letter-Quality Printers

The new, low-speed letter-quality printers are making quality affordable. And the high-speed models are coming down in price too. Still, get a dot matrix printer for drafts & as a backup.

C. ITOH

StarWriter
PrintMaster



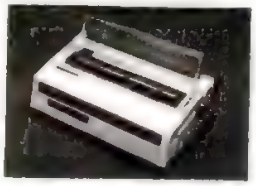
The C. Itoh **StarWriter** (40 cps) offers top speed at a good price. It uses Diablo code, wheels & ribbons, 10 or 12 pitch, 6, 8 & 1/48" line space, plus 1/120" horizontal spacing—ideal for proportional modes. We've found the **StarWriter** exceptionally reliable.

The **Printmaster** has the same specifications, but prints at 55 cps

Starwriter Parallel	**$1219.88**
Printmaster Parallel	**$1569.88**

SILVER REED

EXP-550/500



The Silver Reed **EXP-550** (17 cps) is a 132 column letter-quality printer with 10, 12 or 15 pitch, sub/superscript, underlining and **true** Diablo 1610 emulation, making it compatible with most word processing software. It's friction fed, and it features a page injector: an optional tractor is also available.

The **EXP-500** (12 cps) is a 100 column letter-quality printer with the same specs as the **EXP-550**, but slower and without page inject.

EXP-550 (Parallel)	**$699.88**
EXP-550 Tractor	**$139.88**
EXP-500 (Parallel)	**$469.88**
EXP-500 Tractor	**$129.88**

NEC

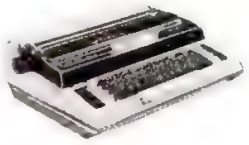
Spinwriters

The new **2000** Series are slower (20 cps), but they've retained all the qaulity of the 3500/7700 Series. Uses the same thimbles & ribbons.

2010/2030	**$879.88**
2050	**$999.88**
3530	**$1639.88**
3550	**$1899.88**
7710/7730	**$2159.88**

SMITH-CORONA

Messenger
TP-1



The **Memory Correct III Messenger** (the full name) is ideal for the home or small office. It combines the features of an electric typewriter ***and*** a letter-quality printer. It features 12 cps, 3 pitches (10, 12 & 15), variable line spacing, 10.5" writing line, backspacing & auto-correction. It comes complete with parallel/serial interface.

The **TP-1** has fixed pitch (10 or 12 cpi) & underlining, but cannot sub/suprscript. The tractor feed is optional. (Specify 10 or 12 cpi when you order.)

Memory Correct III Messenger	**$629.88**
TP-1	**$459.88**
TP-1 Tractor	**$139.88**

Other Letter Quality Printers,

Comrex	
CR-1	**$849.88**
CR-2	**$509.88**
Diablo	
620 (RS-232C)	**$999.88**
630 (PC)	**$1979.88**
Qume	
Sprint 11+	**$1539.88**

Monitors

NEC

JB-1205/1201M



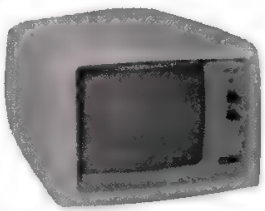
Slick design & slick specifications. The NEC **JB-1205M** is the amber version. The **JB-1201M** is the green screen. Both offer 80 columns on a 12" diagonal screen, with an 18-20Mhz bandwidth and a crisp, clear display.
JB-1205M (12" amber) **$179.88**
JB-1201M (12" green)..... **$169.88**

USI
Pi-3 (12" amber)..... **$189.88**
Pi-4 (9" amber)..... **$159.88**

AMDEK
300G (12" green)..... **$149.88**
300A (12" amber) **$164.88**
310A (12" amber) **$199.88**

PRINCETON GRAPHICS

HX-12



The **HX-12** is one of the finest RGBs available. 16 colors (using NEC's tube), 690 dots by 240 lines (480 interlaced) & 15MHz bandwidth. Comes with its own cable.
PGS HX-12..... **$499.88**

QUADRAM

QuadChrome

The **QuadChrome** has the same spec's as the HX-12. Same price too.
QuadChrome..... **$509.88**

QUADRAM

QuadColor

QuadColor-1 ..... **$199.88**
QuadColor-2 ..... **$219.88**

USR

MultiDisplay

Supports 32K graphics, with composite, RGB, PC monochrome display ***and*** a parallel port.
MultiDisplay..... **$374.88**

TECMAR

Graphics Master

192K for RGB or composite display, supporting 480 non-interlaced RGB output.
Graphics Master **$579.88**

COLUMBIA DATA PRODUCTS, INC. EAGLE COMPUTER

We are now offering both the **Columbia MPC** and the **Eagle PC-2** to our customers. These machines are IBM-PC compatible, with 128K RAM on board, two 320K disk drives, one parallel port, two RS-232C ports and bundled software packages.

The **Eagle PC-2** includes MS-DOS, CP/M 86, plus Eagle-Writer and EagleCalc. The **Eagle PC-2** also includes a monochrome monitor, with a resolution equal to the PC monitor. The **PC-2**'s ideal for first-time users. It's easy to learn & easy to use.

The **Columbia MPC** includes MS-DOS, CP/M 86, BASICA, Perfect Writer/Speller/Calc/Filer, Home Accountant Plus, Fast Graphs, Asynch Communications, a Macro Assembler, plus numerous utilities. This system is for more sophisticated users who have a PC at work and want a system at home or in a remote location.

Please call (603) 881-9855 for further specifications, price and delivery.

Modems

DC HAYES

Smartmodems

The **Smartmodems** are originate/answer, auto dial/answer, full/half duplex modems. There are two external modems (300 & 300/1200 baud) & the **1200B** (300/1200 internal for the PC). Modular phone cable & power supply included. (RS-232C cable is optional).

"Stack" Smartmodems
300 baud **$229.88**
300/1200 baud **$539.88**
1200B w/Softcom II..... **$459.88**

US ROBOTICS

Password

The **Password** is an originate/answer type modem. 0-300 & 1200 baud capability with auto dial/answer, auto mode/ speed select, full/half duplex (local echo),audio phone line monitor. Comes with an RS-232C cable (specify male or female DB-25), power supply & modular telephone cable.
Password **$379.88**

STANDARD MICROSYSTEMS
M-Term..... **$79.88**

Peripherals

AST RESEARCH

MegaPlus II

The **MegaPlus** has one RS-232C port, a parallel port, a clock & up to 256K RAM. An optional game and second serial port are also available. Comes with SuperDrive/Spooler software. The **MegaPak** is a 128K or 256K piggy-back card that attaches to the MegaPlus & gives you additional memory to 256K.
64K MegaPlus **$309.88**
256K MegaPlus..... **$509.88**
128K MegaPak **$329.88**
256K MegaPak **$329.88**
RS-232C Port **$49.88**
Game Port..... **$49.88**

AST RESEARCH

SixPak Plus

The **Sixpak** holds up to 384K on the board. Added to a 256K motherboard, you've got 640K, the maximum addressable memory. **Sixpak** has an RS-232C port, parallel port, clock & SuperDrive/Spooler software. An optional game port is also available.
64K Sixpak..... **$289.88**
256K SixPak..... **$469.88**
384K SixPak..... **$659.88**
Game Port..... **$49.88**

AST I/O Plus II
The **I/O Plus II** has one parallel port, one RS-232C port, one game port & a clock. A second RS-232C port is optional.
I/O..... **$199.88**
ConnectAll..... **$CALL**
RS-232C Port **$49.88**

QUADRAM

Quadboards



The **Quadboard** has an RS-232C port, a parallel port, a clock & memory up to 256K (you can also get your **Quadboard** "naked," with no memory installed). QuadSpool/Drive software is included with every **Quadboard**, along with a one-year warranty.
Quadboard 0K **$219.88**
Quadboard 64K..... **$279.88**
Quadboard 256K..... **$429.88**

QUAD 512+
Quad 512+s have a single RS-232C port on them, and sockets for up to 512K RAM. QuadSpool/Drive software is included.
Quad 512+ (64K) **$239.88**
Quad 512+ (256K)..... **$439.88**
Quad 512+ (512K)..... **$679.88**

Single Function Cards
Parallel Card w/cable **$89.88**
RS-232C Card..... **$89.88**
Clock/Calendar Card **$89.88**

QuadLink

QuadLink lets you run Apple II/II+ software on the PC. It's like an Apple computer on one board, with 64K. You can use all PC I/O's and color/graphics video. There's no disk conversion, no reformatting, and no fuss. **QuadLink** takes up only one slot. Specify IBM PC, Columbia MPC or Compaq computers when you order.
QuadLink **$499.88**

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Amdek Half-Heights
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Two drive set..... **$499.88**

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PC Interface **$130.88**
TI Interface..... **$150.88**

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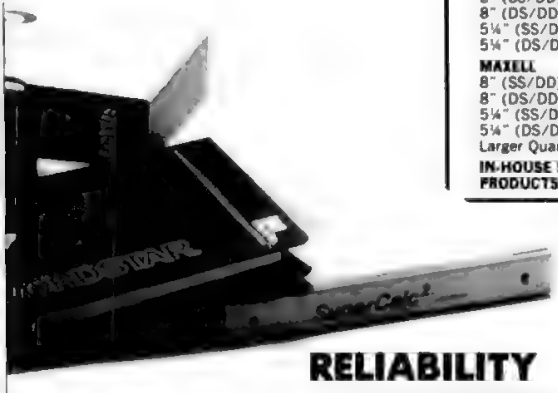
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OASIS™	
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ORGANIC™	
Milestone	$269
PBL CORPORATION™	
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PC DEMO™	
Demo Disk	$ 18
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PeachText 5000	$239
PERFECT SOFTWARE™	
Perfect Writer	$259
Perfect Speller	$129
Perfect Writer/Speller	$359
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Perfect Calc	$169
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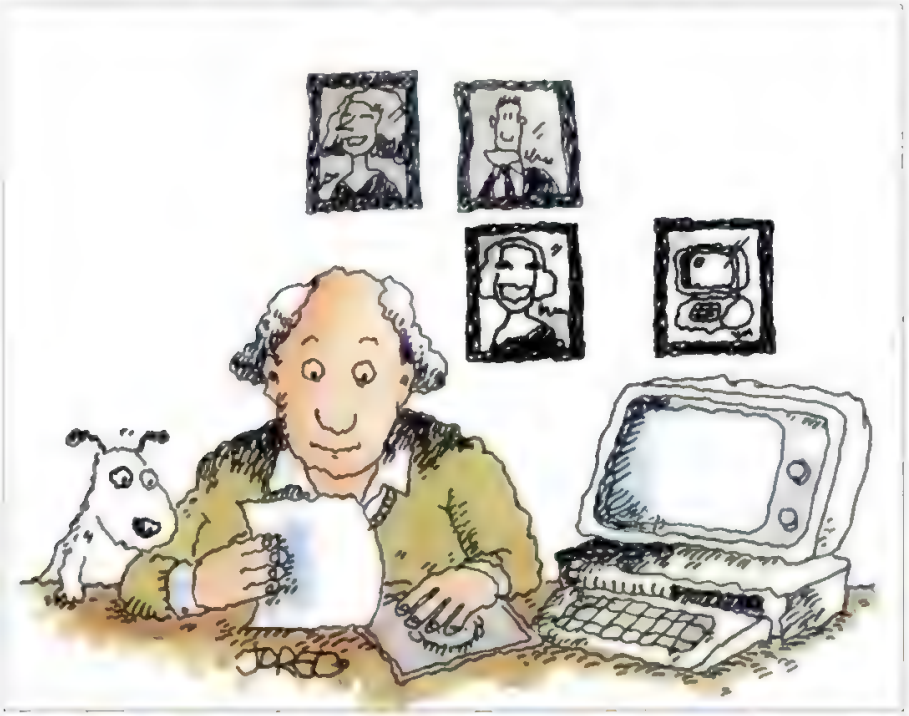
Home is where the computer is. Will you be one of the 10 million lucky workers who in 1990 may well be making the daily 20-second commute?

THERE'S NO (WORK) PLACE LIKE HOME

We all knew it was coming; last night's sky was a dark, baleful sheet of slate, and the evening news led off with a weather map. I woke up to the chorus of New York snow sounds—the throaty scrape of shovels on the pavement, the percussive slap of clanging tire chains, the crunch of heavy boots on uncleared sidewalks, the shrieks of children paroled from school.

You've all probably seen the postcards of Central Park wrapped in a brumal cloak of purest white, its stark, crystalline trees frosted with glittery rime, antique lamp posts softly twinkling into the vanishing point like fire opals on a long string, while a solitary horse-drawn carriage slices a silent track into the dreamy expanse of unsullied snow. Since my apartment windows command the breathtaking vista of a blank brick wall, I was eager to take in the fairyland firsthand before I had to go to work and threw on coat, muffler, and galoshes.

The second I hit the street I was greeted by a flying sheet of slime as a passing cab roared through the vast gutter-puddle of slush. Two minutes after the last flake had settled, New York traffic had churned the pristine blanket into a gray and gritty soup. Ladled over every square centimeter of horizontal surface was a foot or so of a loathsome colloid composed of melting sooty snow, dissolved trash, and murky effluent of hopelessly backed-up sewers. Punctuating this slurry were constant floating reminders that the city was no place for dogs. Fetid, fathomless frozen lakes of slush lapped up over every curb, ruling out pedestrian passage for all but Olympic-quality hurdlers. This was not the stuff of travel posters. Manhattan had overnight been transformed into an obscene slurpy. Eskimos are said to have 50



Illustrations by Jared D. Lee

ways to say "snow." There are about twice that number that come instantly to mind, none of which is printable here.

Winter Wonderland

I skidded down the sloppy sidewalks, braving avalanches of mush tumbling from every rooftop, shotgun blasts of rock salt whirled from convoys of salt spreaders, and stinging ice-spicule wind devils tearing at my eyes, while an icy muck of salt and slush oozed down through my pants and socks to clot numbly in the bottoms of my boots. I gamely fought my way into a dank subway crowded beyond belief, and, soaked to the marrow and utterly fatigued, nose pressed against some vagabond's armpit, I listened while the other sopping straphangers waxed dreamily about July.

July?? In New York? When everyone who is anyone is sipping mint tea under a fluttering beach umbrella and the rest of us working stiffs are melting like fudgesicles in the back windows of old Buicks, or darting from one air-conditioned store to another to avoid the oppressively sticky engine room heat, like desert insects rooted from their holes . . .

Many, if not most, urban workers actually hold down *two* jobs—the one they get paid for, and the one spent getting back and forth from home to office. New York, for instance, draws commuters from as far away as 100 miles. When I first landed a position in New York I was living in Philadelphia and was forced to spend two and a half grueling hours morning and night making the grand schlepp back and forth. The shocking thing to me was that there were hundreds of others on the same train who made this awful pilgrimage each and every day. I quickly moved to Manhattan; those poor suckers probably still log their yearly 52,000 miles.

Take The A Train . . . Please

Each day, American workers waste untold millions of hours on the nation's scandalously claptrap roads and trains. After a morning drive spent pounding horns and creeping down expressways in a seamless haze of car exhaust or clawing your way onto hot, lurching, unventilated trains, most commuters are in the right mood to go into battle, not sit at a desk.

At Home With The Written Word

John Rigo works with the PC as a technical writer in New York because of the control it gives him over his time.



Photograph by Roberto Sandoval

I majored in journalism in college, worked for the Associated Press in New York, grinding out copy at 450 words an hour, then went to work for IBM writing its programmer guides for operating systems and for FORTRAN and PL/I. When I moved to Bankers Trust as its manager of system documentation, I was in charge of producing user manuals for banking applications. In 1974 I took the big step of going independent and have not had an honest 9-to-5 job since.

I spent several years producing technical standards and procedures manuals, end-user manuals, and internal technical system and program documentation, mainly for small software vendors in the New York area. I then moved on to doing this for large corporations.

I LIKE the luxury of taking a nap.

When I was just starting out and eager for work, I happily wrote the manuals for software vendors—I was familiar with this kind of work, and I really enjoyed it. In time, I began getting jobs for large corporations. I loved the smaller projects, but large corporations paid better wages.

At this point, I enjoy working out of my home so much that I'm almost unemployable. I like the luxury of taking a nap in the afternoon if I want to. I just read in the *Wall Street Journal* that CEOs at large corporations do this—if it's good for them, it's good for me. After all, I'm president of my company.

Personal Time Clock

I put in 40 billable hours every week, but I do it on my schedule. As a self-employed freelancer, my salary is higher than that of a salaried technical writer.

There are drawbacks, however. It is a minor nuisance, for instance, to have to interrupt work and run down to a stationery store to buy supplies—it's a lot quicker to walk over to an office supply closet.

The funny thing is that you can really get a lot of work done without the distractions of an office. The big disadvantage about working at home is that you can go nuts. The office environment helps keep you informed about what's going on. I miss the people, there's no question about it. But my client calls allow me to maintain some human contact and see what's going on in the world.

A lot of independent consultants burn out after about 6 or 8 years. I felt myself heading in that direction but, lo and behold, along came my IBM PC. I experienced an immediate jump in my productivity because I became so much more interested in what I was doing. First, I was excited by the computer, and then by the efficiency of my word processor.

Having a PC opens up an additional field of work—I'm getting lots of calls from software vendors selling to the PC market. At the time that I got involved with founding the New York IBM PC Users Group (NYPC), I was drifting away from the technical end of computers. But the activities of the group got me back into the technical mainstream.

When I first got my computer, I had moments of pure terror. My business was going to depend on this machine and I dreaded thinking about what would happen if something went wrong. A guy who earns his living billing customers by the hour doesn't want to have to waste time running around town to get his printer repaired. But the PC is reliable, though I have no confidence in the store where I bought it. This lack of confidence was a primary reason for my founding the user group, which paid off in a big way.

Sure, there are people who use this time productively. We see them portrayed in movies, impeccably dressed, in a plush, uncrowded first class cabin, tapping out numbers on slender calculators and then writing memos with gold fountain pens in elegant leather portfolios. And now that such lap computers as the TRS Model 100 are being snapped up in record numbers, I suppose the myth will be extended to put these in the frame as well. You even hear these bores boast: "Wow, I sure got a lot done on the train this morning. At this rate, I'll have the collected works of Dickens translated into Urdu in just 3 more weeks."

The only problem is that it's tough to write memos while you are busy hurling invectives out the driver's window at the jehu semitrailer jockey who just cut his 80,000 pounds of whale dreck in front of you and forced you onto the shoulder. And not many commuters have a lap to rest their computer on when they can barely find 6 inches of unoccupied subway floor on which to teeter between two drooling psychopaths in dire need of a bath.

There's another changing-workplace myth making the media rounds these days, and this one may actually ring true. As the nature of work in this country changes from processing goods to processing information, manual laborers are starting to feel their blue collars tighten around their necks while corporate recruiters scramble to fill computer-related positions through screaming buckeye help-wanted ads that batten all the big city newspaper classified sections: "MIS PROFESSIONALS! DON'T SIGN ANYWHERE ELSE!! COME TO SUNNY DUBUQUE AND CUT YOUR DREAM DEAL!!" Best selling popular author John Naisbitt (of *Megatrends* fame) has been widely cited as claiming that 60 percent of the American work force moves data rather than hard goods. While some experts peg this figure as far too high, most experts acknowledge that the percentage is far from small, and skyrocketing.

Napoleon, Phone Home

A couple millennia back, some prudent autochthon businessmen, daunted by the snail's pace of long-distance com-

Housing A Business In A Barn

John and Barbara McMullen of New York City remodeled a 200-year-old barn to house their expanding data processing consulting business.

I was once director of data processing for Morgan Stanley & Company, the investment banking firm, and have had over 20 years' experience in large mainframe data processing with the Department of Defense, Dean Witter & Company, and BTSI, a subsidiary of Control Data that serviced over 100 brokerage firms and banks. Barbara, my wife, has also had over 20 years' experience in data processing with such firms as AT&T, Pan American World Airways, the New York Stock Exchange, and Bache Halsey Stuart.

In 1977, we decided to start a data processing consulting business and to concentrate on our specialty, brokerage and banking accounting. During this same period, we saw our first microcomputer, an Apple II, on a co-worker's desk. (The desk belonged to Ben Rosen, founder of Rosen Research, and now a principal in the Sevin-Rosen venture capital fund and chairman of the board of Compaq.) We decided to buy a micro for our use.

In 1978, while doing large mainframe work, we found ourselves using the micro for both word processing and decision support work, and, recognizing the potential, began to bring it to other people's attention. In a period of 5 years our work has gone primarily to micros, our staff has expanded to over 10, and our business has taken us to such places as Mexico City, San Juan, Los Angeles, and St. Paul.

Our primary concentration during this time has been education, the installation of turnkey systems, ongoing maintenance, and, when required, custom programming. Our clients range from individuals to large corporations such as Merrill Lynch, Morgan Guarantee Trust, John Wiley and Sons, IBM, First Boston Company, and Jefferies and Company.

We started the consulting business from our home in Bedford Hills, New York, and almost immediately ran out of space. We then acquired a 200-year-old barn in Jefferson Valley, New York, and began to remodel it to add office space. One of the ironic things is that though living in a community with no mail delivery, we have two neighbors who are users of microcomputers. One is an employee of the IBM Thomas J. Watson Research Center in Yorktown Heights and accesses the computers there from micros both in our office and in his own home. The other is a graphic artist who uses micros both as development devices and as controllers for a typesetting operation.

THE BIG advantage of working in our home—in addition to the ease of transportation—is physical comfort.

We frequently have to travel, and unfortunately spend more time in New York City—an hour-and-a-half drive—than we would like. One of the factors that mitigate the travel time, however, is that Barbara and I commute by auto and travel together all the time, so that the car becomes an extension of the office.

On a normal, nontraveling day, we can rise as late as 8:30 a.m. and still be properly prepared when our clerical staff arrives at 9:30. Our entire house is wired into an Omninet network, so that every room can theoretically become a work station. Our main office, where we receive clients, looks like any other standard office, with desk and computers. Throughout the house are other computers for developmental work and word processing.

Our computer configurations include IBM PCs, Compaqs, Apple IIs and IIIs, as well as an Osborne and a TRS-80 Model 100. Our selection of computers for our client use is thoroughly driven by the application needs of the client. In the early days of our business, the majority of computers we installed were Apple IIs. In the last year and a half, the majority have been IBM PCs and Compaq computers.

A Lofty Environment

Our home and office are both in a three-story barn, with the bottom floor totally devoted to the business. The second floor contains a living room, bedroom and kitchen (with terminal outlets to be used when required), and the upper floor contains a private office, bedrooms, and another computer work station.

The big advantage of working in our home—in addition to the ease of transportation—is the physical comfort. We are able to hold business conferences on a 20-foot deck overlooking a lake. We are able to schedule meetings almost around the clock with no fear of exhaustion on the drive home. The primary disadvantage is that we tend to work much too much. A computer that is always available will be used during the prime working day, in the evening, at 3 a.m., and all through the weekend. This is normal in any self-owned business, but the proximity of the office and equipment greatly magnifies the tendency. This is something that we could only do with work we thoroughly enjoy. We would not be able to own and operate an ice cream stand or an income tax service and live and work this way.



merce, and enamored of the defensive strength in numbers, invented cities. But communications did not really advance dramatically until messages could be delivered by steam, gasoline engine, or electricity. It took Napoleon nearly as long to move men and news as it did the Phoenecians.

The trend toward increased urbification is clearly grinding to a halt and, in many cases, reversing. True there are places like Mexico City that are still ballooning with job-seekers, but these newcomers are relatively unskilled folk with few options. The big, dirty industrial cities of the American Northeast and Midwest are shrinking in their senescence. And these days the bloom is even beginning to come off the Texas rose. A dirt farmer with a radio-link phone line in his tractor cab or a savvy Fiji Islander with a microwave dish in his coconut grove can buy and sell securities as easily as a trader elbow-to-elbow on the exchange floor. And the notion of safety in urban numbers has become laughable in the face of marauding criminal wolf packs and solo yobs who terrorize entire populations.

One of the most shameful aspects of contemporary American society is its pitiful network of transportation arteries. While Japan and even France can whisk their citizens over polished rails in gleaming new trains at breakneck speeds, we pay top prices for the right to crowd onto stuffy, wheezing, ill-run third class coaches where even standing room is often at a premium. Most taxpayers prefer the alternative—the morning adrenalin-pumper ride in the family sedan on poorly kept roads built to handle a third of the load and crumbling after years of absentee maintenance. Circe couldn't turn drivers into animals as fast as the Long Island Expressway does at about 8:00 each Monday morning.

White-Knuckle Rides

Several years back, with the advent of sophisticated telephone data links and the first inchoate peeps of small computers, business periodicals began heralding the dawn of a new era, which they dubbed "telecommuting." The idea was very appealing and still is. Rather than eat smog while exercising their ulcers for an hour each day in and out of town, execu-

Photograph by Roberto Sandoval

tives would work out of a home/office. Spared the sultry straphanger skirmishes and the white-knuckle freeway roulette, these maverick businessmen would greet each sunrise by sitting down with their home-delivered *Wall Street Journals* and snapping on computer terminals to begin wheeling and dealing, while those other poor unfortunates were trapped on a jam-packed train or tossing off the gloves on a clogged expressway off-ramp to duel with tire irons over a crumpled fender.

The advantages of the 10-second commute were numerous, everyone crowed. Doctors, dentists, grocery store owners, and others had been doing it for years. Kiss the missus goodbye and walk through a side door to a waiting room full of paying customers. Or bring her along to handle the bookkeeping and answer the phones.

First, there were the extra 5 to 10 hours of worktime you gained by not having to drive in from the suburbs. This time adds up fast—an hour each way translates into 10 hours every week, or 520 per annum. That's 13 additional weeks of productive work squeezed out of a year. And the statistics on cost savings were equally eyebrow-raising. You could bank a few thousand bucks otherwise spent on train tickets, gas, tolls, and parking.

Then there was the idea of enhanced productivity. You could get up in the wee hours and start cobbling your midnight ideas together. You could work far into the evening and not worry whether the odd scraping sounds in the dark and lonely office building hallways were made by some degenerate dragging a bloody axe; when you were too tired to continue you could walk up the stairs and tumble into bed. If deep down you knew you just were not a "day person," you could punch in with the rest of the graveyard shift and call it a day just as the neighbor's rude alarm was jolting him out of dreamland. Finally, nose-to-the-grindstone workaholics could polish off reams of work in blissful silence, freed from the annoying tyranny of office socializing and time-wasting.

Don Diego, CPA

And there were other charms. Sticking it to the IRS probably headed the list. You partition off a few dozen square feet, haul in a desk and phone and filing cabinet, and presto! Your taxes are slashed as if Zorro were your accountant. Not to mention the considerable savings realized by not having to sign an office rent check the first of every month.

Workers would be spared the anguish and expense of commuting, productivity would rise through the roof, and everyone would be happy and rich.

Finally, there were the lifestyle bonuses. Hard-working, early-rising, late-returning husbands who were just rumors to their children suddenly realized how rewarding a family could be. New mothers with milk legs could save the cost of day care and be with their neonates while keeping in touch with the office over the computer umbilical.

And you could both laugh at life's little nuisances. Rather than have to shop when everyone does, you could have idle salespeople fawning all over you during a slack afternoon. Visits from repairmen and to doctors no longer required sneaking out of an office and hoping you wouldn't be caught or wasting a precious vacation day. Having a sofa delivered would not be the major trauma it can be for a typical apartment dweller.

The business press spun an enchanting picture of superproductive workers tapping merrily away in front of monitors glowing softly in every living room, while cobwebs grew on the car and Wall Street looked at 5 p.m. on a Friday like the ghost town it normally resembles 24 hours later. Workers would be spared the anguish and expense of commuting, productivity would rise through the roof, and everyone would be happy and rich.

Only trouble is, it hasn't happened. And the signs are that it won't, at least in the near future. While there are some thriving pockets of telecommuters, these tend to be populated by highly individualistic writers and programmers in literary or high-tech enclaves, or by consultants who are just striking out on their own and like the low overhead. Companies that have tried systematically installing terminals in worker's homes largely have abandoned their experiments in the face of employee discontent. Most have discovered that their mainstream workers miss the normal social interchange with their "second family" in the office.

Dead Letter Office

There is also a growing outcry from labor activists who feel that by encouraging offices in the home, corporate America is simply engaging in a new form of worker exploitation and union-busting. Their sob story goes that this is just one more way to decentralize the work force and make labor organization increasingly difficult. They also argue that cruel-hearted companies are eager to farm out this kind of job since they can pay for it as piecework, thereby increasing efficiency at the expense of homeworkers—largely underemployed women—who will perform without the need for costly health and retirement benefits.

What this says to others who are more down to earth, however, is simply that unionists want to protect their own skin, and that American workers are scandalously inefficient. Can you imagine how fast the lines at the post office would move, they point out, if the lead statues behind the postal counters were paid by the transaction rather than by the lifetime? And some housewives are benefitting handsomely. They can stay home with their growing children, save a bundle on babysitters, make more than they ever dreamed of, and start a new profession. These distaff inroads are indeed changing the nature of the workplace.

Or as Judy Beckman, international administrative manager of the Washington-based Women in Information Processing, puts it: "Information processing has created the most wonderful career opportunities for women since the beginning of civilization. We do a salary survey every

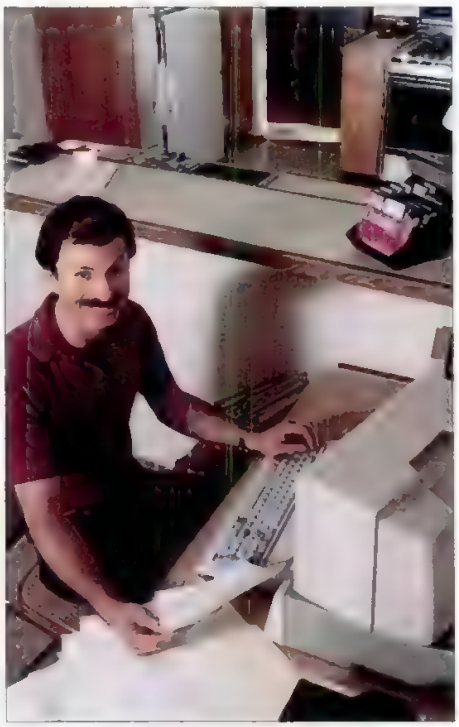
A Computer In The Family Room

Jim Dokoozian built his Anchorage, Alaska home and runs his construction business out of it—a fact he uses to his advantage.

I have been working on starting a small construction company at my own home for 5 or 6 years. I had worked in the construction business all my life, for Boise Cascade, ARCO, and other large companies. I had a strong desire for independence and freedom from bureaucracy. And I had an ideal of the kind of company I could create and strong ideas about how employees should be treated—dealing with them as partners rather than as employees. I've now been doing this for a year and a half and am happy to report that we're succeeding tremendously. I bought my PC last December for the tax benefits and because my business was growing so fast that I was very actively looking for any kind of help I could get to manage the information.

In my business I have to do an awful lot of estimating on projects. I need to manage my work very closely, to compare actual expenses to budget and track my costs. I use my computer for proposals, and have a set series of standard paragraphs in my word processor, which makes things considerably easier. My office manager and I are taking some short courses offered by the local computer stores that are specifically software oriented—we use *MultiPlan*, but are now learning about *WordStar* and Lotus' 1-2-3.

The advantage to working out of my home is that I can wake up in the morning, and by 6:30 be having a meeting with my superintendent and office manager. We all sit at the dining room table and eat breakfast and go over all the activities of the day. We're 20 feet away from a large family room where all my business records and the computer are kept, and we'll go through and make decisions at the kitchen table and then walk over to the computer and check where we stand on budgets for all our projects. That's the reason it's good to have a computer—it's possible to keep



track of two or three projects manually, but right now we're working on nine at the same time. Without a PC, we simply couldn't do it. Many of the projects are similar, and I use the files with the actual data from one project as a template for estimating and preparing proposals for other projects. It's the only way I can do so much.

Another advantage is that I live in a house that I custom-built, and it's terrific when I have clients come over, because I can show them my work. It adds to my credibility to say that I actually live in a house I built. And I save in overhead—I would be spending a minimum of $800 a month extra for an office space half the size of my present office. I also have a very large two-car garage immediately off the computer/family room, where I keep a lot of tools and equipment.

There are disadvantages. It's very hard to separate myself from my work, since I live in my workplace. And there is still a large segment of society that places a stigma on businesses that operate out of homes—those people don't think such businesses are legitimate.

One of the disadvantages of owning a small company is that I'm forced to spend the vast majority of my time putting out the short-term fires rather than making time to work with the computer to build systems and plan long-term strategies. I'd estimate that right now I use it at only a third of its capacity and capabilities. In fact, I've just imported my mother from Alabama. She has a masters degree in business administration and just received a degree in computer science. She is going to spend several weeks just helping to set up more systems on the computer.

When you're using one software package to run your whole business, you can't just stop and start using another. Small businessmen generally don't have large staffs, and my days are spent handling operating problems. I just don't have time to evaluate lots of the new and supposedly better programs out there. You really have to use them in detail to see how they'll fit into your business. You have to make the time to learn more and more about your computer, but it's an effort. Intuitively and intellectually I know I have to do this—but when a customer's sewer line breaks, as happened yesterday, or a crane drops a load, I have to get out on the job site and can't spend the time looking at programs.

On an average day I'll spend up to an hour on the computer, half a day in a driving rainstorm out in the mud, and then meet with a couple of clients and talk to my banker. I switch hats frequently—that's one of the fun things about small businesses.

Photograph by Randy Brandon

year, and our findings indicate that the salaries are way above the average. One of the reasons the industry has grown so rapidly is that it's age blind, sex blind, and totally color blind. It's coming to the point where there are people who know computers and people who don't know computers. It's far more important for a child to have a computer than a bicycle."

Cave Computing

Jack Nilles, a senior research associate at the University of Southern California, claims it was he who coined the catchword *telecommuting* 10 years ago. He says that while there are only 10,000 to 20,000 telecommuters in the country today, most of them working part time, by the end of the decade there may be as many as 10 million. Nilles also claims that if 13 million of us switch from working downtown to sitting in front of home-based terminals, we'd save enough gasoline to reduce our import needs to zero.

The reason many are skeptical is that telecommuting is clearly not for everyone. To run your own show you have to be multitalented and unusually well disciplined. It's easy to become distracted when you're at home with your VCR movies and your stereo and your adorable little brats and an attic that needs cleaning and a car screaming to be waxed and a shelf full of books you always wished you had time to read.

It's also possible to acquire bad habits. Some of the homeworkers with whom we spoke reported that in the haste to get a jump on their work, some disdained such early morning fripperies as shaving and showering and even getting dressed. It's easy for some people to fall out of bed at the crack of noon, pull on a bathrobe, stumble over to the computer, and tap away until it's time again to hit the sack. These are the perfect subjects for circadian rhythm studies in caves without clocks or watches, not Harvard Business School exemplars. To forestall this, some people who labor at home make a conscious effort to rise early and shower and shave whether they need it or not, just to get back into the workaday groove.

Slam Dancing

Just because someone's a crackerjack programmer doesn't mean he'll make even an adequate businessman. Many who have tried to work at home have found the noncreative aspects of their business—making sales calls, buying supplies, keeping books, recruiting assistants—to be their downfall. It can be very frustrating when you're halfway through debugging a brilliant piece of software and you become mired in an argument with a creditor or run out of printer paper. Not everyone can do everything. Well, some can. Fred Astaire could make slam dancing look chic.

Suppose you think this lifestyle is worth a try. You've had it with the office red tape and a business day that revolves around the water cooler. While others are hitting the front door at 4:59, you're just hitting your stride. Your idea of a dream vacation is a week with just you and a clear line to your favorite database; if you show up on an August Monday morning with a tan, people think you're coming down with jaundice. You've always been such a late riser that your summer camp played "Moonlight Sonata" instead of reveille. Should you make the great leap home?

IT'S EASY for some people to fall out of bed at the crack of noon, pull on a bathrobe, and stumble over to the computer.

To many creative people the answer is a resounding yes. The chance to call your own shots, control your destiny, make a ton of money for yourself and not someone else's company, escape the incessant gassing and schmoozing that wastes large portions of the average workday, and toll away at your own pace is too heady for many to resist.

It's quite a bit easier if you have a hot skill, and even better, a client list that will get you started. "Oh look, they followed me home. Can I keep them?" An equally strong success predictor is a steady second income—a wife or husband who pulls in enough to pay the rent while you're learning the ropes—or a sugar daddy who will bankroll your madcap scheme for a slice of the pudding. A flair for marketing won't hurt, nor will a network of colleagues in the business who can steer clients your way and keep you abreast of the latest advances you would otherwise miss by being out of the mainstream.

IBM-Pie Order

But the real secret to prosperity is your PC. Your computer can create, store, and bang out the hundreds of letters, bills, contracts, proposals, and mass mailings you'll need. It can keep your books in IBM-pie order, prepare your taxes, pay your bills, dun your debtors, schedule your appointments, churn out your invoices, and record your expenses. You can use its magical spreadsheet to forge the best business plan you can muster. It can give you up-to-the-second stock reports, broadcast important mailgrams, buy you airline tickets, and do the kind of database scanning it once took dour teams of library researchers to accomplish. If you're careful, it can file away every scrap, memo, letter, telephone number, and sales statistic and then dredge them all up at the touch of a key. It can communicate your important facts and figures with other micro owners or with large corporate mainframes. And it can play a mean game of chess or *Nuke the Spooks* when you need a break.

Many telecommuters are consultants who work out of their homes because the expenses are low. They can write off a chunk of their house or apartment and build up their business slowly. Not surprisingly, many of these consultants are in the computer business. Advertisers these days are flooding the airways and the printed page with exhortations to install a micro in every room of the house and office. Few prospective buyers know what they want or what they're getting into. So the consultants teach the unwary, who get hooked and become consultants who teach other tyros, in a great spiraling Ponzi scheme.

The Anchorite Blues

And you run the risk of becoming too successful. You may start out with just two or three clients and good intentions, but if you really are good, word travels fast. Do you really want hordes of strangers trampling through your living room? Where in the kitchen does the photocopy machine go? You can always hire help, but what will the neighbors think when teamster pickets spring up on your lawn accusing you of paying wages that a hungry migrant lettuce picker would turn up his nose at?

You may find the going tough, and so may your company. According to Dave Foulger, president of the Connecticut PC Users Group (CPC): "While the income and freedom can be intoxicating, the lack of the resources—including the other people who work there—that a big company can offer can be a serious obstacle. Anyway, companies really like their employees to be on premises. This may change, but not right away."

You can beat the isolation by socializing after work, finding an activity to occupy part of your day (one PC owner said she works at night partially so she can play racquetball each afternoon), or taking associates and prospective clients out to lunch. Your favorite restaurant might end up being your office annex, since many telecommuters prefer not to invite their customers home. Some home workers, however, like to entertain clients in their living rooms or over the dining room table, with a glass of wine in their hand. Put enough glasses of wine in someone's fist, and he won't care where he is.

One severe disadvantage is that by removing yourself from the mainstream, you miss hearing rumors and news and stumbling into old friends and potential business contacts. Most telecommuters join computer user groups, professional consultants' associations, writers' workshops, and the like, to keep their hand in—and become even more voracious readers of the trade press than before.

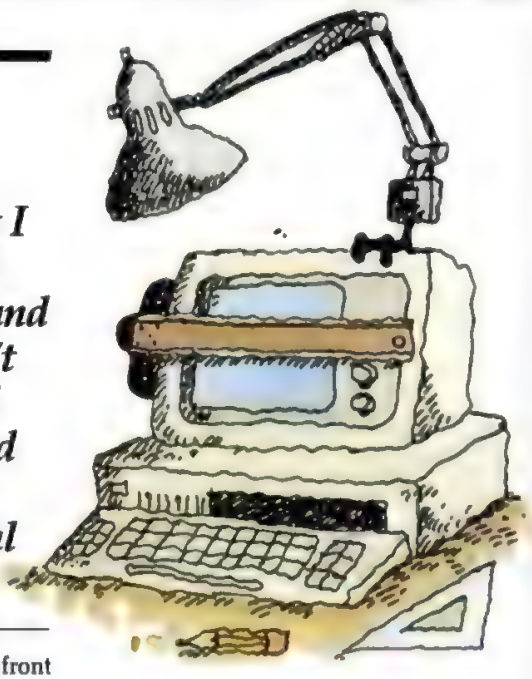
Everyone we spoke to agreed that there is a societal stigma against working out of one's home. It's as if the worker couldn't cut it in the real world or isn't serious about his job. This stereotype is only reinforced when a free-lance programmer greets a prospective backer at his front door wearing pajamas and about 5 days leeward of a razor. Some successful workers have built lavish offices inside or alongside their homes. But for each of these, there are probably a thousand back writers tapping away in bathrobes.

Finally, there is the risk of burnout. The complaint we heard most was that it is far too easy to marry your fingers to the keyboard around the clock and tap blithely away for months or years until it all catches up with you. Since you're working for no one but yourself, you are the sole beneficiary of your talent and drive, and the money can be quite good. And since most homeworkers go it alone, you have to attend to the myriad details just to keep the machinery humming.

Still, if you're a talented, creative go-getter who can't wait to hit his desk or his computer in the morning, and who simply can't abide red tape, office gabfests, or watching your life slip by while your efforts line someone else's pockets, perhaps this life is for you. If you're a writer, or a programmer, or a new parent, or a night hawk, or a budding entrepreneur with a gleam in his eyes and nothing in the bank, it's a safe bet you'll be happier and more productive on your own.

The telecommuters on the following pages explain in their own words why the home office did or didn't work for them. Most wouldn't trade their lifestyle for all the tea in China and freely admit tht they'd have trouble readjusting to a 9-to-5 spot. One even suggested that after a decade of being his own boss, he is now virtually unemployable. Think about these poor dry unfortunates nestling up to a bottomless pot of cocoa and churning out work on their PCs as you fight the commuter traffic the next time you're caught in the rain on your way to a crowded office.

One disadvantage is that I have to pay for all hardware, software, and supplies. I also don't have use of general office equipment and staff—copying machines, secretarial help, and so forth.



John Schnell,
Graphic Designer and Consultant
New York, NY

I got started on microcomputers with a TRS-80 in 1978. I bought it because I was curious about micros and, since my background was in fine arts, I hoped that graphics applications would be available. There were applications, but the TRS-80 was not the right machine. However, it was the right machine for me to learn about programming.

I later had an opportunity to work on an S-100 system in a business environment, which allowed me to learn about *WordStar*, *dBase II*, and other end-user applications. From that job I moved into working for a microcomputer consulting firm that specialized in consulting for large corporations. (At that same time I acquired a PC and helped found the NYPC Users Group. I also started the NYPC graphics special interest group.)

After working for the consulting firm

Home-Grown Publicity

Graeme Thickens and Randy Geise, a publicist and an art director in Minneapolis, prefer working amid the comforts of home.

Graeme Thickens
Public Relations
Minneapolis, Minnesota

I worked for Control Data Corporation in the advertising and promotion department and left at the end of 1982. I've been running my own business for about a year now. I started on a part-time free-lance basis, moonlighting—in the communications business, just about anyone with any creative skills does. It just got to the point where I became fed up with the corporate bureaucracy. And the high-tech business in the Twin Cities area created a large demand for my services.

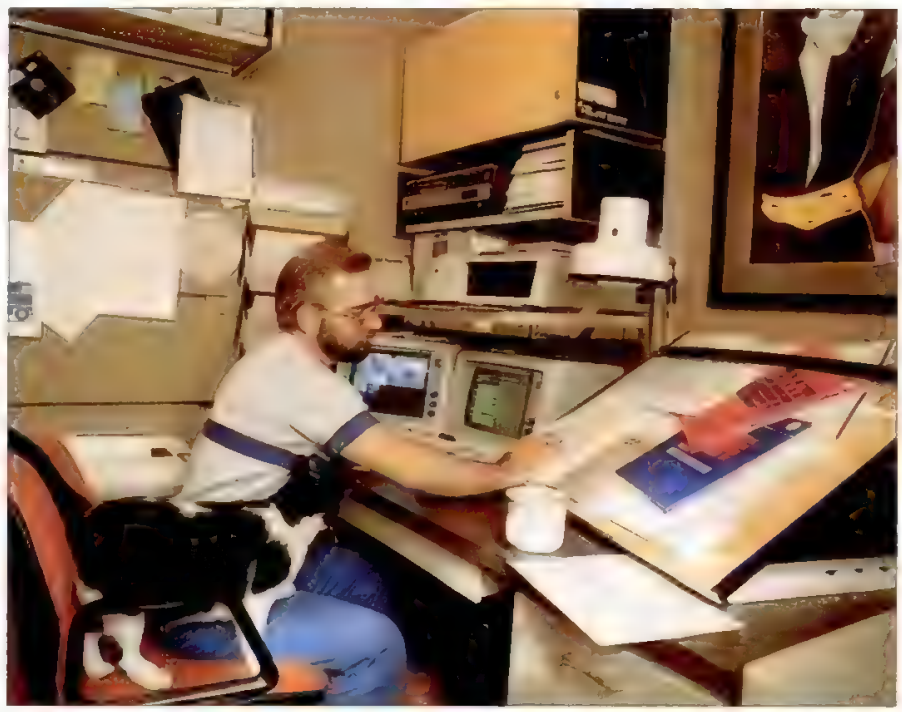
As soon as the PC was announced, I bought one because I knew it would be the productivity tool I needed. For word processing, I think nothing comes close to an IBM PC with *EasyWriter 1.1*. I think it's fantastic but doesn't have the visibility it deserves.

I was going to go out and get office space, sign a big-time lease, but I was leery of all that overhead. I thought I'd try it at home for a few months and see how I liked it. Now I realize that I love working at home, and I have no need to have outside or fancy office space. I schedule almost all my client meetings at the client's offices. I burn a lot of midnight oil at home and I'd rather be doing that here than in some lonely, dark office building.

I have a fully equipped office, with everything I need at my fingertips: the PC, two printers, a color monitor, my Canon PC copier, and more. I sit in a 10-by-12-foot office and am on line to the world with my Hayes smartmodem. I send copy directly to my art director, who also has a PC [see profile below]. We also transmit copy directly to the typesetter in downtown Minneapolis, which saves lots of time, money, and keyboarding errors.

There are one or two disadvantages. In the summer the kids are around, and that





Graeme Thickens (above) and Randy Geise (below).

Photographs by John Neville

can be disturbing. It can be a little disconcerting to have a client show up when the kids are fighting. Also, when you're giving instructions to someone on how to get here and you tell them your office is in your home, you almost want to apologize. You feel that people may think you're not really serious. Some clients will always be more impressed by big offices and big staffs than by quality work. There's always a lot of overhead, wasted staff time, and unneeded employees in a big company. I have a whole network of specialists I can call in to help, and my clients never have to pay for a bunch of deadheads sitting around.

The peace and quiet is a blessing. You can turn on the message machine and screen your calls, walk into the back yard—I'm right on a lake—and watch the birds, take a deep breath of fresh air. I can live without the workaday stress.

Randy Geise
Graphic Design and Art Director
Minneapolis, Minnesota

I started out 15 years ago working in a 500-employee corporation. I worked there 3 years and then started out on my own and have been there ever since. When I first left I formed an ad agency and had an office, and ended up spending all my time, all my evenings and weekends, at the office. Most of the meetings were in clients' offices. I wasn't crazy about the late hours, and my previous partner and I split up the agency. I took the graphic design part and he took the ad agency part.

When I moved, my accountant pointed out the tax and rent advantages in working at home. So I bought a house. I started out with a townhouse and now have a nice four-bedroom house on a lake. I found I could buy a larger house, get the tax advantages, and work my own hours. The combination is ideal.

Quite often, if I have a lot to do, I will go to bed at 10 p.m. and get up at 3 a.m. and work, and sometimes work the whole weekend. I find it's more relaxing that way. I can take the boat out or take a walk by the lake and watch the ducks, or just sit and read a magazine for 15 minutes.

The big problem is that you never get away from your work. It's always sitting there, so if you have a hot project you just go in and do it. If you had an office, you'd just jot down a note or two and do it the next day. I'm single; that helps a lot. If I had kids it would be hard to work out of a home unless I had a lot of discipline. Kids don't generally understand that you're working and can't be disturbed, so it's tougher.

I know illustrators and art directors with families who have tried working at home without much success. One friend tried to work in his house and just couldn't do it. There were too many distractions at home, and he was too accustomed to working in an office. If he was sitting there puzzling over a design problem, the family would think he wasn't working and would come in and distract him—he was trading one set of distractions for another. So he finally built a little separate studio off to the side of the house with a glassed-in walkway so he could work without interruption.

Another friend tried and found he could not get started in the morning unless he got in his car and drove to get a cup of coffee or just got out of the house and came back. This forced him to get up and get dressed and go through the familiar motions of commuting. Another couldn't get used to the fact that he didn't have to get dressed. A lot of people with offices at home end up working in their bathrobe and get sloppy, so they find they have to get up and take a shower and get dressed to be productive.

for about a year, I decided it was time to make a firm all-out commitment to graphics on the IBM. Since I started working on my own, I have done several custom graphics presentations for corporate clients. I'm in the process of designing a sophisticated paint program for the IBM PC. I also am working on developing advanced animation techniques. I'm still doing part-time consulting in nongraphics areas to pay the bills, specifically in custom *dBase* applications.

I've been working at home for half a year, and it suits me perfectly. My development work is totally self-directed and self-motivated, and my productivity is far higher than it was when I worked in someone else's office on client projects.

One disadvantage is that I have to pay up front for all hardware, software, and supplies. I also don't have use of general office equipment and staff—copying machines, secretarial help, and so forth. I tend to work longer hours, spending more time at whatever I'm doing. I'm on my own time clock. When you're working in a commercial environment you meet a lot of people in the course of normal work activities. When you work at home, you simply don't network with other business contacts as well. You are much more isolated and sequestered.

William Schlegel
Real Estate Developer
Anchorage, Alaska

I get up by 5 a.m. and by 6 I'm working on my PC. I use it to lay out programs, handle correspondence, do cost estimating for jobs. I'm usually home until 8 a.m., and then go to work, where I have another system. Then, when I arrive back home at 5 p.m. I put at least another 2 hours on it in the evening.

My firm has over 100 agents in five branches, and during the day I just don't have time to concentrate, because I have people problems all day long. If I am bidding on a parcel of land it's very complex—I have to build into it such factors as what the payment schedules are going to be, what kind of releases are necessary, how the land should be subdivided. That takes a great deal of concentration and quiet. I could work at the office early or

late, but clients will find out that I'm there and call me. When I'm at home they usually don't disturb me, and I can work very late.

I now use *SuperCalc2* and *1-2-3* to think through my proposals and analyze what effect time and price will have, whether a parcel will return enough, what depreciation I'm going to get, and what the eventual resale might be. I now know the programs so well I can analyze everything from start to finish on a typical project in an hour or two. Without a computer it would take a day or two. I have it programmed so all I have to do is just plug in the numbers.

The three company principals all have IBM PCs at home. I'll soon be attaching my computer to a modem so I can hook into the main PCs at work for day-to-day operational information. The PC is a monster; it's always there, and I put in twice as many hours and do twice as many things as I could do without it. It's like a mountain. I go upstairs and tell my wife I'll be down in 15 minutes and 2 hours later I come back and she wondered what's happened to me.

Railton Cabbell
Film Memorabilia Merchant and Writer
Nevada City, California

I used to work in an office as an executive producer for a television station. Now I write short stories. But I make my living running a business buying and selling memorabilia from old movies. I stopped working in an office because I came in on one Saturday and looked around at all the equipment—telephones, typewriters, desks—and realized I didn't belong there. I didn't know exactly where I did belong, but I knew it wasn't in an office. It took me 2 years to find out that I belonged at home.

Each day I get up, I haul wood, I eat breakfast on the porch in my hammock, I feed the cats, I walk through the woods into town for coffee, I sit in the sun, drink coffee, watch people, then come home to work. Then I use my IBM PC to handle my mail-order movie memorabilia business and write short stories.

The best thing about it is the tremendous freedom. I can go fly a glider any time I want, and I often do. The disadvantage is that I don't meet many people. If you work at home, the social avenues are missing from your life. You have to do other things to make up for that. One thing I do is use my IBM PC to send a standardized, well-written letter to ladies advertising in the personal columns of newspapers. Of course they think they're all getting a unique, custom-written letter. It works like a charm.

A good businessman with a so-so product has a far better chance than a great programmer with little business sense.

Spencer Wiedeman
Programmer
Atlanta, Georgia

I've been working on my own now for almost a year. I was a professional programmer at a small software company, but, when entrepreneurial lust got the best of me, it was too hard to resist. I haven't been doing very well so far because I suffered from a long learning curve. My previous experience was in Cobol with big computer systems. It took me a good deal of time to adjust to the PC and DOS.

I'm just now getting to the point of having products ready for commercial publishing. I wouldn't recommend starting a business to everyone. In my case it was more of a compulsion than a rational decision, and I'm now paying the consequences for it. You need all the tools—good ideas, financial backing, a high level of technical expertise, and a marketing know-how. If you have some, or most, but not all of these, you'll have a rough time unless you get assistance in your weak areas.

Back in the infancy of personal computers there was such a dearth of software that anyone who wrote a decent program and put it in a zip-lock bag had a chance to make it. But now the field is fiercely competitive. The level of professionalism in PCs has risen to such a degree that it's hard for one person to make it on his own. What's unfortunate is that a good businessman with a so-so product has a far better chance of success than a great programmer with little business sense.

Delicia Dozier
Accountant
Birmingham, Alabama

Two years ago I worked as a special agent for the Internal Revenue Service. Then I fell in love—with the IBM PC. I couldn't justify buying one as a toy; I felt I needed a more serious use for it. So I quit my job and started my own business. I'm now a CPA and do general ledger work, financial planning, and computer consulting.

I enjoy working on my computer so much that I'd rather do that than watch television or read books. I'd rather sit in front of the screen than do just about anything else. And by the time I finish reading computer magazines there's no time left for other reading.

I like the programming aspect of my work because it's a real learning experience, and I rarely have to do the same thing twice. Every client wants something different, and trying to find a solution to each client's problem is a real challenge. I would not have considered this home venture without the computer. I can get so much more work done, and there's far more potential for making money. It saves so much accounting time and effort.

The best part is being my own boss. It's great not to be tied up in a bureaucracy; it's like being in a whole new world.

When I first got my PC I would use it for such long stretches that I'd miss meals—something I had never done in my life. The time would fly by, and I'd be so absorbed in my work, I wouldn't realize I hadn't eaten until I got a headache. One terrific advantage is that I can work nights and play racquetball during the day for fun and exercise.

If my practice gets too big I'll have to take in a partner and maybe even move to

an office, but I don't want to do that. I'd never work normal business hours again. I would find a partner who would split the normal business hours with me—or have a secretary answer the phone and greet clients. I would probably have another computer at the office, but would only go there when I had to meet clients. I would definitely keep my computer at home and do most of my work here.

Rod Roark
Programmer
Atlanta, Georgia

I did consulting work for about 5 years, which, for the most part, involved working on site even though my business was based out of my home. I considered that multiuser, multitasking capabilities.

When you're working at home you end up doing a lot of the same things you'd do in a conventional office—filling out forms, talking to customers on the phone, and so forth. You are responsible for your own insurance, taxes, retirement—all the things you never really think about much when you're working for someone else. The main benefit is that you have much greater potential for making money, simply because as an employee you can never earn as much as you can make yourself.

Another benefit is the satisfaction of being independent, not having to answer to anyone but yourself. It's not like working for the government where you can get paid for just sitting around and being a warm body. Your business succeeds or



I can work nights and play racquetball during the day for fun and exercise.

better than being someone else's employee, but I still had to put on a suit and tie every day.

Starting in February, I quit consulting, after having written *MultiLink*, a software product that improves PC-DOS giving it fails on your effort, and that's a pretty strong motivating force.

The disadvantages are that you have to work harder because there is so much more to do, and you have to give attention to every aspect of the business. It's not for everybody, but it would probably suit many people who are now working in offices. Many people don't start home ventures because of the security a steady job offers, and because they fear failure.

Brett Salter,
Software Developer and Author of Peeks 'n Pokes *and* Inside Track
Atlanta, Georgia

I was doing some consulting work on large systems and decided to go into business for myself. It was important to me to control my own fate and minimize all the bureaucracy of a normal office. So I started doing database consulting, still on large systems. When IBM announced its PC, I realized that this machine would legitimize the industry and also be a lot of fun.

I put down my money for a PC, and waited 3 months for delivery. When I got the machine, I was totally perplexed. I didn't even know basic things such as which one of the eight possible ways the disk should be inserted, so I decided I had better read the manual. Then I realized the first thing I needed to do was to build a user interface to create a screen-handling utility. To do this, I needed some assembler routines for my BASIC programming. Since the assembler from IBM was not available then, I had to find books on the 8086 and teach myself actual machine code. I was using DEBUG to enter pure machine code into the system, mostly by trial and error.

My next project was a document formatter. I needed something to handle my own correspondence and document the software I was writing. I wrote the back end to a word processor, created files with DOS's Edlin (I now use IBM's *Personal Editor*—I like its flexibility, the speed, the ability to pull multiple files together), and then wrote a file comparison utility and a file management system not unlike *TIM* or *pfs:FILE*. I had these products marketed by an outsider.

About that same time, a friend gave me a BASIC program. When I tried to run it I had trouble, but found the listing was protected. So I wrote a program that saved memory as a disk file—took a snapshot of it. Then I compared the two files and discovered which was the protected byte and



changed it. This was a real find, and the information on how to unprotect files made its way around the country incredibly quickly. I advertised it in tiny ads in the back of computer magazines and sold enough to pay for my trouble.

Several people suggested to me that a list of peeks and pokes would be very useful, so I started working on that project and by November 1982 had the heart of it completed. I kept adding things until I had a full disk. By then I had learned to perform DOS and BIOS calls.

Then I had to start producing the actual *Peeks 'n Pokes* package. I took a cue from IBM and started looking for a company that could give the same kind of packaging as IBM's lower-priced vinyl-binder type software. I arranged for automated typesetting without having to rekeyboard everything, had all the printing done, took care of the necessary postal permits and Mastercard contracts, wrote the ads, placed them, arranged for promotional material, and much more. Then I mailed a sales brochure to the 500 or so people who had bought the BASIC unprotector, and a phenomenal 24 percent bought it. I now run the whole show—from creating the programs and the ads to fulfilling, shrink wrapping, and copying disks.

My commute is now about 60 feet. One of the tensest activities—driving in rush hour traffic—is no longer part of my life. Also, my overhead is low; I converted a spare bedroom into an office and am now in the process of converting part of the basement into a shipping and storage center. I will need to hire someone at least part time to handle fulfillment, but hope I don't grow too big to handle the customers who call with questions and ideas.

A former Intel boss once said I wasn't greedy enough—I wasn't motivated by money; I was motivated by what I enjoyed doing. I hate to leave for very long to go to the printer because I want to give the best possible customer service and I hate handing over the phones to an answering service. I may work in an office sometime in the future, but this is fine for me now.

Karen Maddock
President of Computer Resource Services (CRS)
Rochester, NY

I started CRS in July. I was originally a nurse practitioner, but I left nursing to start a business that would merge programming with my medical skills. I believed that there was a need for medical programming. There is definitely a lack of programs for small physician practices.

My company has taken some strange, unplanned-for turns. At present I'm set up to handle small office accounting, inventory, and payroll. I'll either provide office management software I've customized for outside systems, or I'll handle all such things for outside businesses myself.

Starting a corporation and working out of my home was a smart move. Rent and utilities are a large chunk of money when you're starting a business. My only real expense, aside from the computer, was a telephone. Working from my home allows me to keep flexible hours around my two children, who are nine and five. It allows me to spend time programming and then relax or take care of my kids without having to drive back to an office.

There are several disadvantages. I'm located about 12 miles south of Rochester, so traveling to see my customers requires more time planning than it would if I had an office in the city. The other disadvantage is that breaking into the field is much more difficult than it would be if I were working for a large computer firm and doing consulting on the side. But I sure don't miss the hassles with management and red tape.

Working out of the home is sometimes frustrating, but it's worth it. The worst part is trying to make sales. You almost have to go from door-to-door. I anticipated this, but it's frustrating nonetheless. I think I enjoy working for myself too much to go back to working for someone else, unless it could be on my own terms.

Duane Long
Software Developer
Birmingham, Alabama

I worked for a company called Bechtel as a project controls manager, at Lockheed, and at NASA as a design engineer. I am an entrepreneur at heart, and I am also a diabetic who is keenly aware of the problems of this disease. The two facts led me to form my own home business. My corporation is called Applied Biomedical Computations, Inc., and at present it's about two-thirds of the way through the research and development stage. The first goal is to produce a portable computer about the size of an HP calculator for use by patients with chronic illnesses, such as

At The Races And In The Classroom

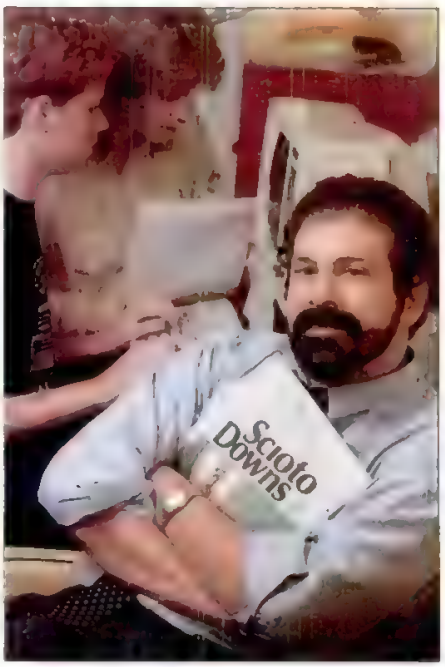
Joseph Oshins of Columbus, Ohio learned to program his PC to keep track of his winnings at the racetrack.

My whole family uses the computer. I initially bought an Apple but sold it and bought an IBM. I'm an English professor and no one in my family knew anything about computers, but 4 years ago we decided that learning computer skills would be fun and very useful for my profession. Back then, I didn't know whether my wife would be interested or not. We also wanted our then 10-year-old son to learn about computers.

I'm the kind of person who learns best when I have a specific application, so I came up with a marriage of a recreational hobby, going to the racetrack, to a computer project. I used this project to learn programming. It was ideal because I learned manipulation of numbers, statistics, databases, testing, report generation—in short, everything needed in microcomputer applications. I have been rewriting and refining and coming up with new studies ever since. I've used the system for three summers, about two evenings a week, and have shown a modest profit all three summers. In fact, I've paid for my equipment, which may not seem that impressive considering the hours I put in. But, of course, I had fun, too.

There were a few spinoffs from this project. I work at Ohio State University in continuing education. Since I've had my PC at home, I've initiated a broad range of instructional programming at the university, which I otherwise never would have become involved with. Having a computer has changed my career. I began the Ohio State University computer camp, and in the last 2 years we've had close to 600 kids attend it for 2-week sessions each.

I also established an on-campus computer teaching laboratory—a facility using 20 IBM PCs to teach students a variety of subjects. We started a public computer literacy program aimed at the general Columbus community; the program uses the lab every evening and all weekend.



WE ALL use CompuServe extensively.

My wife, Linda, had been a research associate at a hospital in Columbus and, after I had fiddled with the PC for a year or so, she got involved, too. She had not had a chance to use the PC, since my son and I had monopolized it, but she managed to schedule her own computer time and learned a bit about *dBase II* programming. As a result, she took on a project at the hospital to set up a database system. One thing led to another and she began learning as much as she could at home. Since, she has become proficient in *dBase* programming and spreadsheet application.

People both in and outside the hospital were asking for her advice on what systems to buy and how to get spreadsheet and database programs running. She quit her regular position at the hospital, and this spring began a new career as a computer consultant. She has picked up a number of jobs at the hospital where she used to work and is earning twice her previous salary and is hiring associates to work with her.

My son Jake is by far the best programmer in the family. He has written a series of programs to keep track of his paper route. He came up with an excellent set of programs to generate his bills, and, if he needed a substitute, he could print out a route list that had fields for such things as which dogs bite and what door to hide the paper behind. The computer camp I started hired him as a programming aide. He wrote most of the camp's daily scheduling and recordkeeping programs, including an electronic mail program for the camp staff. The electronic mail program was put together entirely using DOS commands and sophisticated batch files.

We all use CompuServe extensively, and do all our banking and bill paying on it. My son takes advantage of the on-line encyclopedia for his homework, and I use its electronic mail system for my various projects.

Photograph by Roman Sapecki

insulin-dependent diabetes.

The computer will be used to record the blood glucose levels found as the patient performs multiple tests daily. The computer will use these actual values in an artificial intelligence program to compare them with the predicted blood glucose levels at a given point in time and make the necessary corrections. The main output of the computer is the prediction of the blood glucose level in relation to diet and activity for the patient in a 24-hour period.

This enables the computer to tell the patient how much insulin is required and when to administer the insulin injection. This is significant because it gives the patients a freedom they've never had before, enabling them to eat what they want when they want and maintain their diabetes in tight control as defined by their physician. There are over 5 million known diabetics and approximately an equal number of undiagnosed cases in this country, so there is a great need for this type of program.

My company is the only one that uses a predicting algorithm and is actually involved in clinical trials with outpatients, using a manual form of our algorithm. After the computer instructs the patient, it will communicate the information to the host computer. The values obtained from two to six tests per day are accrued for a period of time—say 30 days—and are then transmitted to the host computer where they're stored under the patient's file.

The host computer then redirects those values back to the physician's computer—it can be a personal computer or a dumb terminal—and displays the blood glucose levels graphically over time so the doctor immediately knows how well the patient has complied with his prescribed diet, insulin, and activity regimen. The physician can then make corrections to help the patient comply with his instructions. These new corrections are uploaded from the physician's computer to the host computer and then downloaded into the patient's portable unit.

The personal computer has made this type of application possible. My office is here at home, although I also work at and fund research for the diabetes hospital, the University of Alabama Medical School in Birmingham, which is downtown from where I live. When I'm home, I frequently communicate via my PC and modem with the VAX that's located in the hospital to upload and download files for statistical analysis.

The network that allows patient-to-host communication is the IBM mainframe network called IBM Information Network, which is in 50 cities, and 200 more with Telenet and Tymenet links. This means that patients can instantly communicate with their physician anytime they're near a phone in a major city. More importantly, if you're a doctor you can consult with diabetes specialists on staff at the university of Alabama hospital. This way the general practitioner has access to current advice and knowledge.

John Vandegrift
Programmer
Atlanta Georgia



THE PC is the most wonderful thing since sliced bread.

Some time ago I was doing some contracting work and realized that the only time I'd leave the house was when I had to talk to a customer. The work I was doing was in conjunction with starting a company, and the company didn't work. I do like the ability to set my own hours and deadlines, be my own boss, and play during the day if I want to.

Right now I'm working both in an office and at home. I'm managing three of Hewlett Packard's systems, and I'm on call 24 hours a day, 7 days a week. I'm a troubleshooter, and I use my PC to talk to the company mainframes. For instance last night the mainframe communications lines weren't holding up and I had to reset them from my home using my PC. I also use it to talk to all the bulletin-board systems.

It's hard to work at home. It's hard to motivate yourself on a day-to-day basis and easy to get side-tracked. A major project may last several months and, for these, self-discipline is critical. Working on a long project precludes social contact. Another problem with a long project is that you don't see the rewards until it's done and you walk out the door. And when you're home, it's often difficult to locate your co-workers when you need to ask them a question.

Lynn Lary
Bookkeeper
Portland, Oregon

I was employed as a full-time bookkeeper but quit when I had my first child. I decided to take on bookkeeping jobs for small clients, since I could do this from my home and work as many or as few hours as I wanted. However, I was doing all the work manually, and it soon got to the point where I could not take on any more clients. If I wanted to expand my business, I had to either devote more time to it (which I was unwilling to do) or get a computer. The PC had just been released, and my husband and I decided to buy it.

I love the PC. It's the most wonderful thing since sliced bread, and it's given me a whole new creative outlook. After hav-

ing two children going "oo-oo, gaga" at me all day, I can go to the computer and feel I'm doing something creative and adult. It's a real sanity saver. It's challenging to figure out how you can use it to help your business in ways you never dreamed of.

I'm doing things I never would have considered doing without it. For instance, I'm editor of *The Associated Oregon Kiters Newsletter*, a publication for people who like to fly kites. If I didn't have the computer, there is no way, with constant interruptions, I would even attempt to write an article. And I'm not a very good typist. It has made my business far more fulfilling; I get much more accomplished. It's taken all the drudgery out of working. I no longer have to worry about balancing my ledger—it's all automatic now. But my PC makes sure I never get in trouble—it won't let me exit if my books aren't perfectly balanced.

If I have a job, I can choose my hours. I'm overjoyed that I don't have to work an 8-to-5 job. The bad part is, while I can plan activities within my day, I can't always plan those within my week, because if I have several clients all with a crisis, I have to drop everything. Financial statements need to be produced very quickly. I make it a point to have a fast turnaround.

You can never get away from the PC; it's always there. If you leave an office with things you haven't finished, you tell yourself you'll work on them at 10 the following morning. When the same thing happens and you're working out of your home, you just go and do it.

Sometimes my husband turns into a real computer widower. I have to watch and make sure my computer time doesn't press into my family time. I like the fact that I can save a lot of money on rent, phone, clothes—my standard wardrobe around the house is jeans and Nikes, and I don't want to change that.

Laura Meadows, Esq.
Attorney
New York, NY

I got out of Harvard Law School in 1960 and spent my first 21 years working for large law firms and major corporations, Mobil Oil, Merck, Armco. When I left Armco a few years ago, I wanted to establish my own practice. I wanted the independence and the choices you are able to make when you select your own clients.

Working from my own apartment saves the enormous overhead involved today in having an office on Wall Street or in midtown Manhattan. Normal overhead nowadays, depending on the degree of luxury, where you are and how much support staff you have, can be frightfully expensive—a Park Avenue office can run $30–$60,000 per year per attorney.

The nature of my practice is to give more attention and in-depth service to a smaller number of clients, and I find working at home well suited for this.

I am fortunate to have a very large apartment with enough space to swallow a computer in the living room without having it interfere too much.

The original computerized legal database, LEXIS was previously available only on Mead Data's own dedicated computer terminals. To my great joy, in October Mead made LEXIS available on the IBM PC. And of course, Mead also offers the NEXIS database, which is not as important to a lawyer, but is a convenient resource to have so readily available. This should allow me to give my clients even better service.

The commute to work is ideal. The price of the overhead is right. And the flexibility is very nice. This allows me to provide excellent legal service to my clients without passing along high overhead costs. At times I miss the social atmosphere of a large law office and the convenience of being able to nip next door to talk over a legal question with another lawyer, but on the other hand I have more time to devote to professional organizations, and still see other lawyers at lunch and business meetings.



I CAN PROVIDE EXCELLENT LEGAL service to my clients without passing along high overhead costs.

The Association of The Bar of the City of New York has a service called WestLaw which is a computerized legal research database.

Chris Allen
Consultant
Jacksonville, Florida

I own a company called Associated Computer Consultants, which was set up to allow many consultants to work together and share the overhead. Some of our consultants are free-lancers, and some have jobs during the day. Originally the idea was that we'd run the business out of homes and communicate via telephone—we had the communications without the overhead.

Later on, as we grew, we got a 12-by-12-foot office in the IBM building. In many cases, it was more convenient to patch in the phone line and go home and work where it was more comfortable. Last February we started a publication called *Access Jacksonville*. It's a newsletter that goes out to 10,000 people in Jacksonville—sort of like a super users group. A lot of our people send their text over the phone lines to us. We do the editing and then enter typesetting codes and communicate it directly over phone lines to a typesetter.

Our company has grown to the point where we need an office, but we encourage people—if they are sufficiently self-motivated—to work from their homes. Half of an office is making sure the receptionist answers the phone and is not out talking to somebody. That's really not necessary with a computerized office and workers phoning in material. Professional programmers and consultants don't need the extra supervision.

One of the main things that slows this operation down is that there is no way to handle two telephone lines coming in at the same time. We're looking into a package called *MultiLink*, which allows multiple users to use one PC. This is specifically designed for communications and even comes with its own multiuser bulletin-board system. Programming can be done at home. People with a terminal can actually do the work on the main office computer.

The newsletter has been so successful that we've published Pensacola and Tampa editions. To save on long-distance phone calls and everything else, we all use CompuServe to upload and download

Software Packaging At Home

Nancy Frank, of Atlanta, Georgia, uses a PC in her home business. When she's not packaging software, she's packaging lunch for her kids.

I began working out of my home in 1969 when, after leaving IBM to start a family, I was asked to do consulting work, and the consulting business just grew and grew. My base has always been at home. I have two children to take care of while I work. This way I didn't have to put them in a day care center and could always be there when they got home from school. Working at home made it easy to pick and choose my hours based on the kids' schedules.

In 1980 I became fascinated with micros and decided to change the focus of my consulting business from large systems to smaller ones. When the IBM PC was announced, I knew I was in the right place at the right time. The small room I had always used as an office became too small, and when I bought my second PC, I took over the playroom. When I bought my third PC, an XT, I had to take over the entire basement level of the house.

I now have employees who work here—the XT is used for all of our business, invoices, names and addresses, mailings, and sales reports; the PC with a color monitor is used for program development; and the other PC is set up for communications. My secretary handles all the business affairs using the XT. I've gone from working 20 hours a week to working 60 or 80 hours a week, and obviously I could not work out of an office and maintain any sort of family life. I recommend this arrangement for women with children. The children love it—they earn a good bit of their spending money by helping with the business, doing clerical work, and even some programming.



Photograph by Alan Weiner

The only negative aspect is that if you're serious about your work, you can't get away from it. It's awfully hard to close down at 6 p.m. on Friday and forget about work until Monday. One reason is that the business phone rings around the clock, from as far away as Hawaii. In fact, I've taken the bell off the phone in the bedroom.

Home businesses offer significant tax and personal benefits. There is no question that my home is an office, and I can take off a certain percentage of all home repairs, taxes, mortgages, insurance, and utilities on my tax return. I love not having



to commute—I hate driving, and it's wonderful to get 2 extra hours of productive work time that would otherwise be spent driving in and out of the city.

All in all, I highly recommend working out of the home. I can keep a flexible schedule, visit doctors, shop when it isn't crowded, take advantage of super sales, and always be there when repairmen and delivery men come. I don't have to schedule my work day around a plumber. It's the perfect situation and schedule for me and my particular life-style—I'm always there, where I'm needed, for whoever may need me.

files. This lets us effectively open offices in other cities with little or no overhead. We can all keep in touch all by computer. I feel so strongly about this that I told the two people who work with me they would have to make a commitment to telecommunications before they got the jobs.

Stevanne Lehrman
Consultant
Boston, Massachusetts

I've never worked in an office. I was trained as a technical librarian and have always been interested in analyzing and organizing information. I had been curious about computers but never had the chance to use one while they were still in the hands of the high priests—the mainframe operators.

A year ago I was hired to do a competitive analysis project for an OEM producing banking software. In the course of it, I used a VAX to maintain various lists I was compiling into a database. When I finished there, I looked at various micros and bought an IBM. The banking industry job market was tight back then, and instead of working, I spent the time learning about the PC to gain additional skills that would make me a more attractive worker.

I joined the Boston Computer Society (BCS) to help learn how to use the IBM, became involved in the club activities, and volunteered to become the resource librarian. I'm a self-confessed computer bibliomaniac and at the BCS meetings there are always questions from people who have jobs needing to be done.

Someone at one of the meetings asked for software reviewers, and I tried my hand at it. I decided it was fun, even better than reviewing books, which I had done in the past. I began writing reviews, wrote a few articles for various BCS publications, and suddenly found myself with a business. Now I review software, write magazine articles, and have gotten into writing user manuals. A major software publisher that had seen my work asked me to edit a user manual and help the programmers redesign some of the screens to be more user friendly and understandable.

I have an office at home; I'm just moving out of half of a bedroom and taking over the dining room. I set my own hours, generally 9 to 5 with half an hour for lunch. If I have a hot project, I'll work longer; if I am between projects, I'll take a little more time. I haven't had too many problems with deadlines, because my family is very supportive—I have been known to work all weekend.

WE HAVE just one PC around the house that I use all day long, but at night my husband and daughter and son fight for it.

We have just one PC around the house that I use all day long, but at night my husband and daughter and son fight for it. My daughter, Julie, is in 9th grade and is very interested in science; she leads the IBM PC junior users group, part of BCS. This year they're hoping to design and write their own program.

Mark Slichter
Professor
San Francisco, California

A lot of people who work at the University of California at San Francisco (UCSF) can accomplish their work as easily at home as in the office, especially the faculty and computer research staff. The IBM PC is by far the most popular computer at UCSF.

If we didn't have computers at home, we'd have to work at the office. We prefer working at home because office time is used for the kinds of activities that involve other people; the time at home can be used more productively because it's quieter. There are fewer interruptions, and we can communicate with others directly at the office when we need to.

We're actively working on a number of methods to interface the home micros with one another and with the university's

mainframe—such as disk format standardization, using certain communications packages, and coming up with a system to translate 5¼-inch PC diskettes into 8-inch displaywriter diskettes. Many of us are beginning to use the telecommunications portion of our mainframe system to upload from home to mainframe and then download our files into our office machines.

The university is beginning to see the value of having staff members work at home. Far more work gets done this way, the department heads are unofficially beginning to support purchases of machines for home use. There's been a program in effect since the spring, which offers a discount through the school to make PCs available to people who otherwise wouldn't have been able to get them. In some cases, the university helps pay for them, too.

Bill Pittore
Programmer
Boston, Massachusetts

I write system-level copy-protection software for the PC. I've been writing in 8086 assembler for 3 years. Before this I worked for a company that made data acquisition systems. I quit to try to go it alone—sink or swim. It takes a lot of guts—I had been there for 5 years and told myself that if I didn't make the move at that time, I'd regret it later.

It's been great. I needed more time to think more about what kind of software I wanted to write and sell. It was hard to make the time to think about future applications while I was working for someone else. One of the big things I found out is that marketing is about 80 percent of the ballgame, and if you don't devote most of your time to marketing, you get nowhere. This becomes apparent to lots of people who are just starting out and have a product and put a few small ads in magazines and suddenly realize that the world is not beating a path to their door.

When you're holding down a full-time job and trying to run a small business out of your home, it's easy to burn out. Since I didn't want to burn out, I decided it was better to run my own business and devote most of my time to it. I knew that if the business didn't make it, I could get another full-time computer job.

I was relieved when I quit, because the two jobs were creating a tremendous amount of pressure. It helps if you either have a lot of money behind you or have a two-income family, which lessen the initial shock of zero salary. On the other hand, while the risks are very high, so are the rewards.

THE greatest advantage is that I can get up in the morning and start working without having to shave and get dressed.



John Bowling
Investment Consultant
Cincinnati, Ohio

I was a vice-president of an employee benefit consulting firm and as a sideline I was an investment advisor for Cincinnati professionals. My activities as an investment advisor became substantial and I left my other job to work for myself. It's worked out very well indeed. The greatest advantage is that I can get up in the morning and start working without having to shave and get dressed. I read the *Wall Street Journal* and the *New York Times* and am then ready to place orders to buy and sell securities. I start to work at 7 a.m. I used to go into town and get to work at 8:30 or 9:00. I don't place orders using my PC because I let my clients choose their own brokers, but I'm giving consideration to this for the distant future when it becomes more common. I have acquired a program to keep track of portfolios that also automatically generates reports.

I save money operating out of my home. I don't have the expense of an office. I don't, at present, need one. When you have an office you feel obligated to hire a secretary just to have someone sit there. People don't often come to my home. Most of my time is spent managing portfolios, so I don't need a fancy office to



impress clients. I can also get telephone calls any time of day or night, which my clients think is wonderful. This is especially handy, since I have all their records at my fingertips.

Ronald Easton
Financial Consultant
Manasota, Florida

Two years ago I bought a PC for financial modeling and word processing, and I work out of my home. I initially considered buying an Apple but changed my mind when the PC was announced. Working at home with a PC is the only way to go. You have the current and future support of IBM. I believe they'll be the leader in technology.

I owned an IBM typewriter for 10 years and the PC keyboard is very similar. I tried the Apple keyboard and it just didn't feel comfortable. The main advantage of having the PC at home is that I can start at 8 a.m. and work straight through to midnight. It gives me the flexibility to keep whatever hours I want. If I get up early—say 6:30 in the morning—I can walk over and turn the computer on and work until the kids get up. Also, costs for using the Dow Jones News Retrieval Service drop after 6 p.m., so I do my researching and database work at night to take advantage of the lower rates.

One other benefit is that my kids can use it for writing assignments and math homework. Also, my fiancée is a stockbroker, and we're looking forward to getting the next IBM product if it's compatible with the PC. And my kids have a small Commodore, so we'll be a three-computer family.

Dick Davis
Genealogist
Asheville, North Carolina

I'm one of a group of five people, most of whom are genealogists, that formed a corporation, bought a PC, and installed it in a rented office so that all could share the single machine. Each member of the group uses it at different times and for different purposes. One woman and one fellow each use it to publish a newsletter for a different genealogical family association. My daughter uses it to generate mailing labels and handle membership records for a religious association. One member of the group is a numismatist and uses the PC to catalog coins. One of the other users is a retired government worker, and the last is a retired army officer.

We divided up the time slots very carefully. Some work on it during the day, whereas others use it at night and on the weekend. We've broken each day into three-hour slots. Our total investment was $8,000. Some group members invested $2,000 and some $1,000. We allot time according to the size of the investment. Since we incorporated the PC, we can all legally use the same software on it.

We're eagerly waiting for a Palo Alto software writer named Howard Nurse, who wrote a genealogical program for Apple called *ROOTS89*, to release an enhanced version of the program for the PC. We looked for a year before we selected the PC. IBM had all the features we wanted, and we liked the name. And we're all just delighted with it.

Alex Lane
Consultant
Jacksonville, Florida

I work in an office, and, in addition, I do whatever free-lance consulting I can at home, mostly translating scientific articles from Russian into English. I've reached a compromise with my family so that I get up sometimes at 5 a.m. when there are no interruptions and the phone isn't ringing off the hook. A bonus is that if I do need to use CompuServe, at that hour it's cheaper and less busy.

Watching The Market

John Bertl of Houston used his PC as a commodities day-trader—until a "PARITY 1" error cost him $50,000.

I have owned a computer since Radio Shack came out with its first Model I. I am an engineer and had worked in Libya for Exxon for 5 years. When the State Department recommended that all Americans leave Libya, I got out and found myself unemployed. I just couldn't find a job I liked or was qualified for. When I returned to the States, I couldn't believe how far microcomputers had advanced. When I had left 5 years earlier, they were in a fairly primitive state; when I came back I saw things like disk drives, telecommunications, and modems and realized I had a lot of catching up to do.

Then a friend I had met in Libya, who had left about 2 years before I did, got me started with micros. He was an auditor for Exxon and was really good with money. This friend was investing in the futures market and had lost money because he couldn't tell up to the minute what the market was doing. He had rented a computer and accessed a data exchange. During the trading hours, his wife would sit in front of the system and watch the market. She would call him at work every 15 minutes or half hour or whenever the market was moving. He was making money at this, but he suffered one big loss that he could have avoided if he'd known in time that the market was going against him.

I once sat in for his wife and became totally intrigued at what he was doing. I saw where I could make more in an hour than he made in a week, a possibility when you're a "day trader." My friend wasn't; he was a long-term trader. I traded a couple times when I was watching his computer for him, and I made $6,000 in about 2 weeks, so I took the money and went and bought a PC. Then I subscribed to the same data access service he was using, which essentially gave me second-to-second tics on market performance.



Photograph by John Grossman

I started doing this the first of the year and have been averaging about a $400 profit per trade. If I trade every day, it's $400 a day—not counting weekends or holidays. My friend and I were dealing almost exclusively in gold. He had a theoretical model of how it would perform based on a 6-to-7-week cycle in gold that repeated itself consistently. However, for some reason, it stopped following this pattern in June.

Essentially, here's how we make money: We're averaging $10 a day between the low and the high prices for gold, and the market is open from 8 a.m. to 1:30 p.m. By noon, if I have only a $3-to-$4 range, yet I know I'm averaging $10, I would expect the range to increase by $6 in the next hour and a half. So I use all the data input, figure out which way it's going, and buy or sell gold accordingly.

I did this for a half a year. I was on my PC from 7:30 a.m. straight through to 3 p.m. I couldn't even get up to go to the bathroom for fear of missing something important. So I knew I had to come up with a better way to read the tics.

Then I wrote my own software to handle this for me, and could go away for the first 2 or 3 hours of each day if I didn't want to trade during that time. When I would come back, I'd have every minute of trading detailed on a bar chart, with columns and prices, the whole bit, for any commodity I wished to look at. I am giving the software that does this away free. I've also written lots of other programs for people I know.

Meanwhile, people in the local PC users group were coming to me and asking which software to buy. Most of them wanted spreadsheets, and I'd tell them that virtually any spreadsheet would do what they wanted with difficulty, but that the best program would be one that was expressly written and customized for their specific needs. Then I'd create one for them.

One program I wrote took 2 weeks to write; it gave users buying and selling sig-

nals in the stock market. All the user has to enter is the Friday closing of the stock he wants to follow each week. The entire thing is menu driven and it computes 40, 15, and 5 week averages. I've given copies of that away as well.

I'm now a full-time student at the University of Houston, taking assembly language, advanced math, and Pascal. I've been with my PC an average of 10 to 14 hours a day since I bought it. I'm really unhappy about IBM end-user quality and support. I'm now working on my *fourth* replacement PC because my hardware has repeatedly failed. Each time it breaks my dealer replaces the PC with another, but during this time I can't do any trading. Once, several months ago, I was long on several contracts I should have gotten out of but didn't know the market would crash—and lost over $50,000 because my PC broke that day! I'm definitely switching to Compaq. Compaq says they're IBM compatible—the way I see it, IBM ought to say they're Compaq compatible.

This isn't something I want to make a career out of. If I made lots of money consistently, I'd do it for a few years and then go live on a yacht. But experiencing $50,000 daily losses because your computer is giving you a "PARITY 1" error that's not your fault, and nobody at the computer store can help you, is pretty discouraging.

The PC makes my classes at college super easy. With my word processor I can type out my programs as necessary. I have a screen editor to edit them. If anyone wants to get on the computer at school, there are fewer than 30 terminals for over 270 students. To get a terminal, you have to get in line at 7 a.m. and sign up. But with mine, I can dial in from my home. So can others, but they have manual dialing, and I have *PC Talk III* and have played with the timing defaults so that I can redial every 10 seconds. So I can sit here and do my math homework, and my PC is dialing up the VAX at school. With *PC-Talk* on automatic, an alarm rings when the connection has been made.

Then, since my function keys can store my password and logon information, all I have to do is tap a few keys and I'm automatically connected. Other students with other software or other computers will not be able to send the programs they write at home to the VAX because the VAX won't accept straight downloading unless the pacing is exactly right, and *PC-Talk* in conjunction with the IBM is the only system that will do this properly. Otherwise I'd have to retype everything on a terminal at school. Anyone else could use his terminal at home as if it were a terminal at school, but unless he had the pacing capability, he could not send complete files in minutes.

There's one more interesting benefit of working at home with my PC. For the first year of my son's life, I didn't get to see him because I was in Libya. The tense political situation prevented my wife and child from joining me there—the government simply wouldn't let them come. Then when I returned I was able to spend time with my son. I was on the verge of getting a divorce because my wife and I hadn't been together for so long. I didn't have a job and couldn't afford child support, so I took care of my son during the day while I worked on my PC in lieu of child support. But now things look like they're on their way to getting patched up, and we're becoming a family unit again.

Some people say they would give their eye teeth to work out of their home like this and make this kind of money. But I'd jump at a good engineering job if one came along.

The disadvantages of working at home are that it takes time away from your family and that people sometimes interrupt your work. Quite often family members ask me to watch the kids or run down to the store. Another drawback is that you have to have two of some things, such as printers, if you work both at home and in an office.

Working out of my house lets me use the resources I own without having to take them to the office. I've noticed a real resistance in the business community to people who work out of their homes, because it's something new. This is not true about where I'm working now, but in other companies, many supervisors still feel it's more important for a worker to come in at 9 and leave at 5 than to get the job done. There's a real bureaucratic mentality out there.

PROGRAMMING is addictive. If you don't have the self-discipline, you end up working far too much.

John Springfield
Consultant
Boston, Massachusetts

I'm a consultant. That means doing everything from talking to people about computers to actually designing and programming both micro and mainframe systems. I now work out of my home. The last office job I had was as a programmer for an OEM company that took DEC minis and added financial software and sold it as a bundled system.

I struck out on my own because I needed the freedom—the ability to call my own shots and sink or swim on my own ability, rather than to be judged by a large organization. Four years ago I snared a project designing a program for a mainframe company and started working on my own.

There are tax advantages in setting up a home office, but you do have to devote one room of your house to an office. In terms of taxes, of course, I can also depreciate my car and my computer, which is a plus.

One of the real advantages is that I can be with my kids during the day when I have nothing else to do. During the day you'd like to keep making money, but there are times when you want to take a break, and it's nice to have your kids right there. However, if you have small children, they can walk in the room at the wrong time. I have a one-year-old and a three-year-old; if I'm on the phone making an important call, it's a little distracting when the 1-year-old decides to start crying or the 3-year-old begins banging on the door.

Programming is addictive. I've sometimes gone through the night working on a program. If you don't have the self-discipline, you end up working far too much. You're always there—open the door and you're at work. You can burn yourself out; that's another reason it's good to have kids around.

It is important to keep up with things when you're home all the time and don't circulate. I'm president of the Boston chapter of the Independent Computer Consultants Association, and an executive of the IBM PC users group. The Consultants Association helps me keep up with what's going on, and the PC users group specifically keeps me up on the IBM PC. I read about 10 magazines a month—that's a big source of information. And this year, for the first time, I had a booth at the *PC '83 Trade Show* in Boston.

The name of the game is drumming up business. If I get a mainframe contract, the typical length of steady work is about 3 months. I've also been doing some in-house training. I have to prepare for that and I charge a premium for my time. I want to make my living dealing with microcomputers. I've been in mainframes for 10 years, and, quite frankly, they're just not as exciting as the PC. Right now about two-thirds of my time is devoted to microcomputer clients and one-third to mainframe customers. But in terms of money, it's about half-and-half—and I'm spending a lot more time developing micro contacts. I don't see how I could ever go back to an office—I just got too used to this.

Jack Pellett
Meteorologist
Asheville, North Carolina

I'm a programmer and systems analyst at the National Climatic Center (NCC) in Asheville, North Carolina, where we develop computer software for quality control and editing meteorological observations. The NCC is an archive for weather records from all over the United States.



THERE'S no point in staying at the office, since I can do everything in my home with my PC that I can do in the office.

The people who report such statistics as rainfalls, and maximum and minimum temperatures, send data in to us, as does the National Weather Service. I work with a VAX 11/780 during the day, and at night I use my IBM. I bring files from the VAX to the IBM via modem, transfer them to disk, edit the files at home, and then send it back to the VAX for testing.

I can also create programs on the IBM and download them to the VAX. Then I can interactively test them on the VAX from my PC. I do this maybe once or twice a week. I'm in a carpool, so I can't stay late and use the VAX—and there's really no point in staying at the office, since I can do everything in my home with my PC that I can do in the office.

Janet Cameron
Writer
Boston, Massachusetts

I've been a magazine writer for 15 years, in the microelectronics and printed circuit trade industries. I pick people's brains and write articles for the layman or professional. One problem I find is that I never stop working. It's difficult to separate my professional life from my personal life. When I have a thought at 2 a.m., I jump up and run downstairs and turn on my IBM PC and start writing.

It's utterly addictive. Ten hours can pass and I will look up and find it's noon. If I worked for a company, I wouldn't work as hard. I'd wait until the next morning.

One other disadvantage is that I know I have to keep up with what's going on, especially with things happening so fast in microelectronics, and it's hard. Things can actually become obsolete within a week. Working by myself I don't interface with people on the leading edge of technology. Things change so fast they can actually come and go without my ever knowing about it.

Dian Crayne
Writer and Programmer
Orange, California

I spent 10 years in data processing, most of it as a programmer analyst. My most recent job was in the marketing division of a small computer manufacturer. I decided I was spending too much time commuting and too much time on peripheral work that took up my day when I

should have been doing other things.

When you are in an office environment, there is always a steady stream of people coming in and out. Probably a quarter of my time was spent on the telephone. It's not true now because I can block out my time more efficiently. Generally I can get my phone calling out of the way in the morning, leaving the rest of the day free for me to write articles or do programming or whatever else I want—and I can do it at my own speed.

WHEN I have a thought at 2 a.m., I jump up and run downstairs and turn on my IBM PC and start writing.

I like being able to work according to my own schedule. I do miss the very thing that caused me to quit in the first place—the people coming in and out. Because it's very hard to get used to working by yourself, I have kept strict business hours. I get up in the morning at the same time as my husband, who still commutes. I take half an hour off for lunch, and generally work a few hours after dinner. At home we have a PC, an Apple II, a TRS 80, and a cute Commodore 64.

It was hard to adjust in the beginning. The first 2 months were difficult, but now I really like working at home.

Bill Barker
Newsletter Editor
Arlington, Texas

I once worked out of my home, but my business got too big and too busy. I do transportation and urban-planning consulting, and I've started to do some training programs for the IBM PC. When I first moved the business to an office, I left my PC at home, and my wife demanded that I move my PC back to my office because I was spending so many hours on it after I came home from work.

Before I became a consultant, I was working for a private regional planning agency. My decision to quit and go into business for myself was made easier by the computer, because it can handle most of the typical office chores.

When the business was in my home, the only problem was that my wife became frustrated that I spent so much time on it. Eventually we just got to the point where we had to see clients and have someone to answer the phone. At home the computer does take up a lot of space, which was also a bit of a problem. When you're at home, it's easy to watch television or get distracted fixing lunch. It's important to get away from the refrigerator and the television.

Computers do strange things to people. A fellow who wanted to work with me and who was very interested in computers would spend all day banging away on the computer. It was strange to have someone coming over to the house not to see me but to see my computer.

Sigrid-Marie Kaeufer
Director, The Paperless Office
Washington, DC

We started as a consulting firm, and last year became a retail outlet for many microcomputer brands. We also run the training and educational facility of our parent company, Micronet. We give a lot of seminars and workshops and train users on the equipment we have here; we also do a lot of consulting.

I'm responsible for end-user training, and during most days when I find I need time to concentrate, I do my important planning and thinking much better at home. I can get random thoughts at the office, but when I have to pull it all together, I can do it far better after hours. I have a family, and rather than spending 14 to 16 hours a day away from them, I work at home for the opportunity to spend some time with them.

The arrangement also makes the knowledge I have on how to use microcomputers available to my daughter, who uses mine to do some of her homework. I very seldom finish my work before 7 or 8 p.m. If I think I can finish by 6 p.m., I stay in the office, but otherwise I take my work home.

Some people are more creative in the morning, some at night. I've had some of my greatest ideas between midnight and 3 a.m. I find that during the day, as we work on budgets or forecasts, I can input the data, but when I want to work on what I've input, I need the peace and quiet of home to really concentrate on trying out complex "what-if" possibilities. And if I have to edit reports, I can take them home to really polish them.

Tiger Keathley
Executive DP Recruiter
Hyattsville, Maryland

Several months ago I worked for an organization that provides data processing services. I now basically do the same thing except that I work out of my home. I market independent consultants who provide data processing services to clients within large corporations or government agencies. I entered this field because I realized there were a lot of very excellent independent consultants with limited exposure to the marketing area. Since I was good at marketing and had a technical background, I decided I would help these people find work.

I get up in the morning at 6:30 and walk into the next room, and I'm in my office. I usually start work at 7:30, and the day generally lasts until 11:30 at night.

We use the computer for keeping a data bank of resumes and for word processing. When people phone in with specific needs for certain skills, I can instantly go to our database and call up the right person by name, by specific skill, or by familiarity with a certain type of hardware. Also, as a favor to managers, we provide in-house placement for career changes—we're headhunters.

There are disadvantages to operating out of my home. The phone rings around the clock. If you're dedicated and interested in succeeding, you don't want to miss a call. Twenty-four hour availability provides a whole additional layer of service—clients can call all the time. Interviewing usually has to be done at a restaurant since I don't normally bring clients

into my home/office.

On the other hand, when I do ask someone over to my home/office, it's very comfortable. We can hold a regular conversation without feeling we have to get up and leave; we can have a cup of coffee or a glass of wine.

I obviously work more than before—anyone who is operating a business him or herself does work harder and longer. The name of the game for anyone in business is survival. You find incredible resources within yourself. Our micro is a definite help. It's not only fast, but thorough—it can present names of people we've long forgotten about. We have about 500 names in our database—the computer's memory keeps track of them a lot better than mine does.

MY WIFE demanded that I move my PC back to my office because I was spending so many hours on it after I came home from work.

People can always sit around the dining room table, too, which gets them to talk. We will probably rent some commercial office space when we outgrow the facility here. My business is starting to crowd out my house. Two full rooms are already devoted to office space and we're working on a third. More than likely we'll still work at least part of the time out of our home, especially since we can switch the phone calls back and forth with call forwarding.

What's especially nice about the computer is that we now have an automated calendar that tells me where I'm supposed to be and what I'm supposed to do and whom I'm supposed to call. I love every second of it. */PC*

Living The Good Life

Screenwriter and homebody Harvey Berger, of Mar Vista, California, enjoys the leisure of working at home with a PC.

I left a job as a writer/producer for the CBS television network in Hollywood in 1978, and since that time I've been free-lancing out of my home using a PC to write screenplays and miscellaneous projects including television specials for Bob Hope and George Burns' latest best-seller *How To Live To Be 100 Or More*. Right now I'm working on two major films, which we will begin shooting shortly.

Since I got the computer, it is all I talk about—there's a fraternity of people out there who just can't wait for an excuse to start discussing computers. Even when I first learned about sex, I didn't talk about it as much as I now talk about computers. I used to walk into a magazine store and leaf through *Penthouse* and the motorcycle magazines; now I head straight to the computer magazines and look through *Creative Computing* and *PC*. Computers have changed the way I think and work. For 32 years I used the left side of my brain as a lounge, and now, for the first time, I've filled it with office equipment.

Actually, what really set me off on computers was reading *PC*'s interview with Marsha Norman (see "Marsha Norman: A Broadway Playwright Collaborates With The IBM PC," *PC*, Volume 2 Number 3). Word processing enabled her to revise her writing so easily that she no longer compromised the editing process just because she didn't want to retype the same page over again. For every one screenplay I used to write, I would end up typing the equivalent number of pages to two or three plays. Also, the cost of typing services was beginning to be a financial drain. The PC paid for itself in no time.

When I began to shop for a computer, I looked at all the brands and spent a few days listening to salespeople whose idea of sharp selling was flinging reams of numbers at me. Since I didn't know much about computers, most of this information went over my head. You walk into a store and see all the exotic equipment and keyboards that have twice the number of keys you're used to. I kept telling people I didn't want to launch the space shuttle, I just wanted to write a screenplay.

Tried and True

After looking at a dozen different machines, it became clear that the PC was a tried-and-true piece of equipment and was going to dominate the market. My biggest fear was that I was going to spend a lot of money on something that was going to become obsolete, but, with IBM, I didn't worry too much about this. I had already had a lot of good years with the Selectric II. I used one for 10 years before I bought the PC, and I still use it for typing envelopes and labels. But, after using the PC keyboard I feel like I need a sledgehammer to hit the Selectric keys.

I work on a lot of projects simultaneously. When I have a tight deadline I can work right up to the last minute, since I don't have to worry about having the manuscript typed and copied. With the PC, that's all done automatically. I also have a TRS-80 Model 100 lap computer and I sit on the sofa, turn on the TV, and write with the Model 100 on my lap.

Since I work alone, I do miss the social aspects of an office, but the TV keeps me company. It has become the "people" in my office. I have a nice suburban ranch house with a hot tub and trees in the backyard and a TV in every room. I haven't tried working with the Model 100 in the hot tub yet, but, when Radio Shack comes out with a waterproof version, I may. I have taken it on a sailboat, though.

I used to carry a notebook and draft everything in longhand and then retype it. Now I just type it into the Model 100 and upload it into the PC, because the 100's word processing is very limited. I also bring it to meetings and use it to take notes. Working with two computers at once is difficult, though. I sometimes get things switched or confused, and I find



I'm learning more about the inner workings of both machines than I thought I would, so I can get them to talk to each other.

At the beginning my work was exhausting because I was juggling my time between the creative writing and the learning about computers. Now I'm used to the technology, and I'm finding my job easier. I'm getting to the point where I don't have to think about the computer any more, I just think about the writing. Sometimes, though, in an effort to move as fast as I can, I hit the wrong key and the computer does something unexpected, and I panic that I've lost something and won't be able to get back to it.

My office is a converted bedroom, so it's nice and quiet. I lounge around all day in gym shorts and tee shirts—that's all I'll ever wear. My time is my own, so if I want to start working at 5 a.m., as I do frequently, I just roll into the office.

Developing Discipline

The biggest drawback is that working at home required me to develop a personal discipline in order to get my work done. It took me 3 years to learn to pass by the kitchen without stopping every time. I now appreciate what people at home during the day have to go through—there is so much nonsense that can drive you crazy—like people coming to the door to sell you stuff. On the other hand, if I decide I want to go out and do something, I have the freedom to go. I go shopping any time I want to, not at the end of the day when everyone shops, and the lines are a mile long. I walk on the beach when I need to think or take in an afternoon matinee if I am particularly burned out.

I tend to procrastinate a lot. I can write for concentrated periods of time, but I can't just get up at 6 a.m. and write until nighttime. I need diversions all day long; domestic jobs like cleaning, break up the day. The woman I live with works in an office. I end up doing most of the routine housework, and I do most of the cooking. My girlfriend thinks this is wonderful. I've become a serious cook. I love creatively cooking. It's very similar to writing, though sometimes it's actually better because I don't have to eat my own words.

I hope I never have to work in an office again. I like the leisurely, peaceful environment of working at home. I'm a home person; I like to spend time here where I'm comfortable. An office is so cold. In this part of the country it's not uncommon for people to work out of their homes. Many of my friends do, so we can get together quasiprofessionally during the day. And, if one of them calls me and asks if I want to drop everything and go sailing, I can usually postpone the work I was planning to do until the evening.

I've noticed that people seem to be gaining more and more awareness about computers. Many are still pretty skeptical. But it's not a question of the investment, so much as their fear of technology. Everyone I know who uses a computer for work is happy with it. It's odd when a bunch of writers sit around and talk about computers. This happens to me all the time—I'll be somewhere and I find myself launching into conversations about operating systems with total strangers.

I do work more often than I once did, but this may be partly a result of the novelty of having a PC. I would venture to guess that once the novelty wears off and the PC becomes just a tool, I won't work as much. It's like having a new car; you swear you're going to wash it each week, but before long it's so filthy you can't even tell what color it is anymore.

Photograph by Scott Windus

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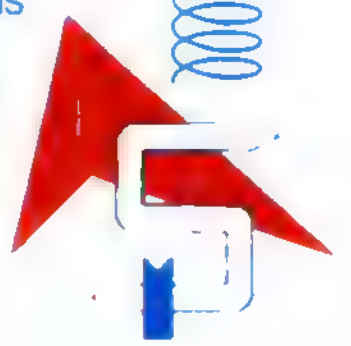
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Finding it is not easy, but furniture designed to fit your computer's size, function, and environment represents more than mere luxury.

Sitting Pretty: A Computer Furniture Primer

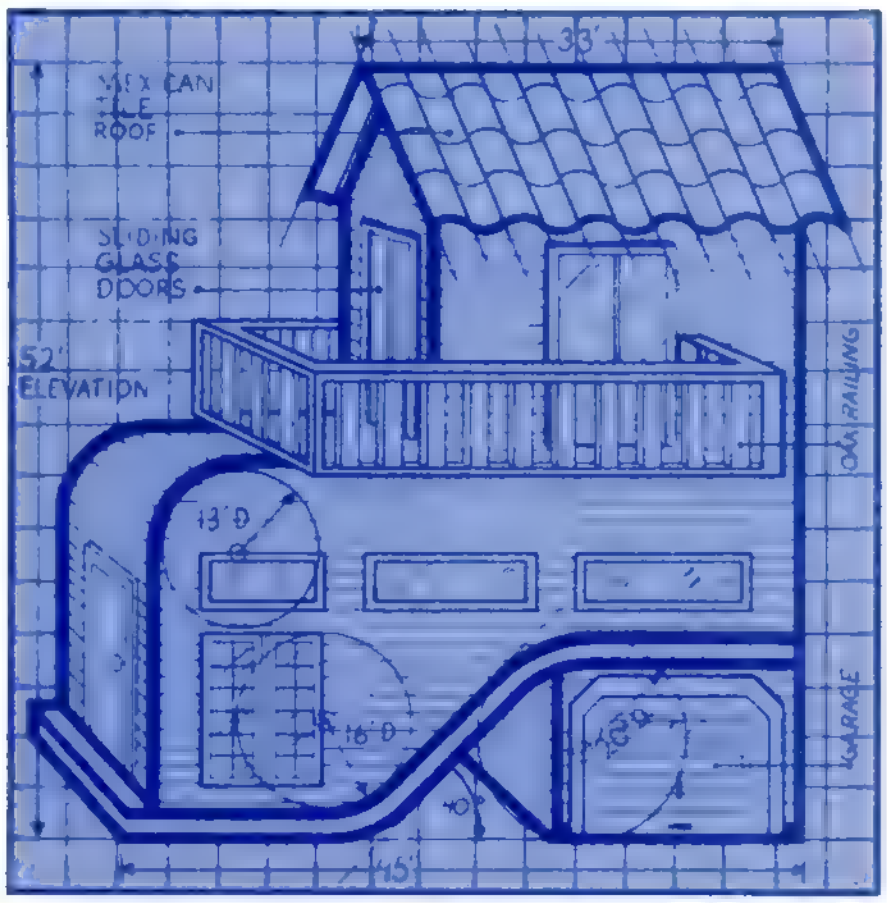
A friend of mine owns a very nice antique oak dining set—with a computer in the middle of the ball-and-claw dining table. Another friend spread his system over a card table in the den. And there is a dentist I know—a little more progressive—who has an entire room set aside for his machine. But until he finds the right furniture, he keeps track of his Wall Street investments while cross-legged on the floor in front of his monitor.

Most PC owners discover that they need a comfortably furnished arrangement if they plan to spend much time with their computers. But as recently as 5 years ago, about the only furniture available for terminals (micros were barely in existence back then) consisted of utilitarian tubular-steel and melamine tables. Now, at least 50 companies nationwide make furniture specifically designed as a microcomputer work station, and perhaps half a dozen



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more are entering the market each month. In spite of this plethora of goods, connecting with a market outlet remains a problem.

Shopping Difficulties

Finding a selection of computer furniture to choose from is a bigger problem than you might expect. Consider what happens when you walk into a computer store. Some have computer furniture for sale; most do not. You will rarely find more than one or two models on display anywhere. This hardly constitutes a selection.

You grab the salesman by the collar to ask him about the furniture. He would much rather talk about memory boards and the latest word processor. There are several reasons for this. According to one manufacturer, "Technical people seem to have a bias against furniture."

This view may be a little exaggerated, but it can't be denied that most computer salesmen care more about the electronics (and maybe the software) than furniture. Furniture function, quality, and esthetics are simply outside their field of expertise and interest.

Eric Littlejohn of Realwood Component Cabinetry in Dallas, Texas says, "One of the main problems with this type of business (computer furniture) is a general absence of trained sales personnel. You really need a person who is cross-trained in both furniture design and hardware use. We train our own people, but that takes time."

From the point of view of the computer store owner, even though computer furniture commonly has a better profit margin than computer hardware, it doesn't move as fast. It ties up precious working capital for relatively long periods of time. In a business that is as competitive and volatile as microcomputers, the store that can't turn over its inventory quickly may go down the tubes.

On the other hand, salesmen in furniture stores can tell you everything you need to know about trade-offs in materials and prices and styles, but they don't know anything about the sizes, shapes, and uses of the computer hardware. They feel more comfortable selling you a sofa or a dresser. The furniture store may carry a computer table or two, but again, this is no selection.

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According to Michael Wertman of Gusdorf Corporation, in St. Louis, Missouri, the end of the confusion in marketing computer furniture is ". . . a matter of time and education. We as manufacturers have a responsibility to help the retailer become aware of the consumer's needs. Furniture is usually a peripheral product, not the preoccupation of the salesman. We are in the pioneering stages of computer furniture. Specialty computer chains are the most likely route to market."

Richard Schaeffer of Bush Industries, Little Valley, New York, has similar faith in existing channels. "The computer specialty stores are slowly changing. They now realize that the computer desk is an integral part of the sale."

For most manufacturers, this is a replay of the problems they have had for the last 30 years in trying to market stereo and video furniture. Many good small and middle-sized computer-furniture manufacturers have become tired of futile attempts to market their products through conventional computer- or furniture-store channels.



The Anchor Pad International computer security system locks in each component individually, permitting easy removal for service or relocation.

Even some of the largest companies privately express dissatisfaction with their existing marketing system. For this reason, many furniture makers make an end run around the problem and sell directly to the public with some sort of mail-order program. Also, very few will refuse to sell to you if you walk in the front door of their plant.

Electronics-furniture specialty stores do exist if you look hard enough. These stores sell only computer, video, and stereo furniture. They do not sell any electronics hardware or any other type of furniture.

Eric Littlejohn of Realwood sees his company as the vanguard of a new retail specialty. He has several stores and is thinking about opening more in his area. "Our sales have increased significantly every year for the last 7 years, especially the last 2 years, and especially in computer furniture."

Ideally you would want to be able to select your computer furniture from a wide selection at a single store. Look in your *Yellow Pages*. It's increasingly possible that such a store may exist in your area. If not, you can probably find exactly what you want if you spend a little time checking out all the likely sources.

Materials and Construction Trade-Offs

A thorough look at the materials and construction methods should make your choice of furniture easier.

Three major material groups are used in the manufacture of computer furniture. The primary differences among them are cost and appearance, not function or durability. Under normal conditions, you can expect most models to outlast your next three systems.

Vinyl Laminates

Wood-print, vinyl-clad particle board is used to make the least expensive models. Manufacturers are becoming expert at mimicking the color, pattern, and even the texture of real wood on vinyl. The printing process produces a finish perfectly consistent in tone and grain pattern with the original. The vinyl surface is water- and alcohol-proof and is reasonably impervious to minor scratches. Declares Michael Wertman of Gusdorf Corporation in St. Louis, Missouri, "We feel that the materials we use [a combination of vinyls and melamines] are as durable as or more durable than other materials. They also provide advantages to the consumer in terms of cost, care, and maintenance."

MELAMINE and steel furniture rarely is designed with the home environment in mind.

But one disadvantage of vinyls is the particle board substrate to which they are glued. Particle board is a stable and cheap medium, but it is quite heavy and has little fibrous integrity of its own. The heavier a piece of furniture is, the more likely it will be dropped when moved. Because of the lack of grain structure, particle board can be irreparably crushed if dropped on an edge or corner.

Vinyl veneer also has been known to snag and tear along the raw back edge while being dusted. Improvements in glues and manufacturing techniques make this much less of a problem than it used to be. With care, vinyl cabinets and tables will last a long time. If you damage them, you may have to throw them away, since vinyl furniture can't be refinished.

Melamine and Steel

Office furniture and store fixtures have long been made of melamine products (Formica is one) with tubular steel legs. It would be hard to find a material group that costs so little and holds up so well to outright abuse. Melamine is so tough that it often is used for tabletops on the vinyl desks. And steel is practically indestructible.



Lifeline Information Systems of Sandy, Utah produces this solid wood CPU cabinet, and printer and monitor stands to complement your existing wood furnishings.

QUALITY furniture can last a generation or two, but 5 years is an eternity in the computer business.

Go to computer stores, furniture stores, and department stores. Also write to appropriate manufacturers for information (see sidebar, "Computer Furniture Sources," accompanying this article). Some may have a dealer in your area, and most will ship if you request it.

Determining Your Needs

Before making your purchase, spend a little time thinking about who will use your system and how they will use it. If

However, melamine and steel furniture is rarely designed with the home environment in mind. The combination is used mostly for sizable modular office groupings where the utilitarian look is desirable.

Though melamine typically is laminated on particle board, with its inherent weight and crushing problems, most pieces are designed so that either the steel frame or a heavy-edge trim protects them. The cost of melamine work stations falls between that of vinyl-clad furniture and wood.

Wood Veneer

A well-made solid wood-and-veneer piece is top of the line in both price and quality. Wood characteristics vary, but in general, lumber is durable and can take the abuse of everyday living. The few dents and minor scratches that can make a synthetic piece look tacky tend to give a lumber piece more character.

There is a certain romance attached to real wood that people seem to be rediscovering after two decades of synthetics. "It has a depth and richness you can't get with either vinyl or even wood veneers," says Daniel Durante of FineTech Furniture in Woodbury, Tennessee.

But solid wood has its drawbacks. It is expensive and it requires rather labor-intensive construction to get around the

AMBIENT humidity changes can cause wide wood panels to contract or expand.

fact that ambient humidity changes can cause wide wood panels to contract or expand. This wood movement requires either more complicated (and expensive) cabinet substructures, such as frame-and-panel construction (almost never applied to computer furniture), more complicated (and expensive) joinery to allow for wood movement, or painstaking parallel-grain carcase assembly.

A good finish on all sides of the cabinet can slow down the moisture exchange between the wood and the atmosphere, but it does not halt it or even limit it. Some wood can split and crack with humidity changes due to pre-existing internal stresses in the tree from which it came.

Susceptibility to vermin is another drawback to solid lumber. This problem is worse in some parts of the country than others and varies from wood species to wood species.

Veneers have suffered some bad press as a result of glue technologies in use prior to World War II. The veneers attached with the animal hide glues in use at that time tended to blister and pop off their substrate over a period of time. Fortunately, this is not a characteristic of modern synthetic adhesives.

Veneer permanence depends to a degree on the substrate on which it is mounted. If it is mounted on solid lumber with parallel grain, and if it has a different coefficient of expansion due to moisture absorption, the difference in the movement of the wood can eventually shear the glue joint and cause the veneer to come loose. On the other hand, veneer mounted on plywood (itself a construction of cross-banded layers of veneer) with modern adhesives is likely to remain in place long after solid wood constructions have cracked or disassembled themselves.

several people will be using it at different locations, then you need something with casters. If children will be using it, an adjustable keyboard height would be nice.

Consider the tasks the computer performs for you. At some risk of over-generalizing, there are two primary uses for microcomputers: business and pleasure. These applications tend to require completely different furniture-design priorities.

The professional needs lots of empty table space to lay out reference materials. The accountant has his ledgers. The writer has research materials, illustrations, and rough drafts. The programmer has technical manuals, listings, and flow charts. The engineer has drawings, reference tables, and other notes. For these people, function takes precedence over appearance.

To the occasional user, table space is not very important. The corporate manager who uses his machine occasionally for spreadsheets or other analytical programs rarely needs much room. He already has a big desk for laying things out. He doesn't want his computer to get in the way of the rest of his work. Compact size and mobility take priority over elbow room.

The game player needs room only for a good color monitor, a couple of joysticks, and maybe a keyboard within reach. The CPU and disk drives even can be tucked somewhere out of the way.

Since recreational computer use is frequently discouraged in the office, games are more likely to be played at home in a den or living room. Making the computer look as if it belongs in the room is often the major concern. Compactness, appropriate furniture styling, and wire concealment are the chief considerations.

To further compound the problem of computer furniture design, it is the rare user who fits neatly and exclusively into one of these two general application categories. Says retailer Eric Littlejohn, "We find that our typical customers are hard to categorize. They run along a continuum. "They may have originally come into one of our stores looking for something to house what is essentially a game machine. Later on, as their experience with computers grows, they add more equipment and do more things with it."

Don't forget to think about equipment upgrades you may make in the future. While the trend in hardware is towards smaller and smaller CPUs and data-storage media, keyboards and monitors aren't likely to change much. Remember that quality furniture can last a generation or two, but that 5 years is an eternity in the computer business. Leave room for peripherals that may not have been developed yet.

MODULARITY extracts a certain toll in styling.

Types of Computer Furniture

Computer furniture designs tend to fall into four broad categories: modular work stations, computer desks, carts, and cabinets.

Modular work stations generally are designed for professionals and anyone else who intends to spend a significant amount of time in front of the monitor. Modular systems consist of a series of separate pieces of furniture that each have but one intended use. For example, the main tabletop is one piece, the printer stand is another, and a set of media storage drawers is yet another.

A typical grouping can range from about $500 for the O'Sullivan CT710 Series and the Gusdorf CompuTable Line to several thousand dollars for more traditional-looking designs.

The chief advantage of the modular work station is flexibility. It allows you to customize the layout of the furniture itself to reflect your unique work space and hardware requirements, no matter how big or small.

This versatility comes at a cost. Since each modular piece may be used independently of the rest of the grouping, it must necessarily be fully engineered to stand

The main problem with plywood is the cross-band layer immediately under the surface veneer "telegraphing" its raised grain patterns through the surface. The likelihood of this happening depends on the quality of the materials and the care with which they were prepared.

Particle board provides a very consistent and stable substrate for veneers without the "telegraphing" of plywood. This is why it is used extensively by most upper mid-range manufacturers in their tabletops and casework. The disadvantages of weight and poor repairability can be largely offset by protecting the edges and corners with solid wood.

Contrary to popular opinion, veneers wear well and can (with requisite care) be stripped and refinished.

A prudent man does not disparage veneers. The very best names in furniture today (Henredon and Drexel to name two) have made extensive, and wise, use of veneers.

Shipping

Computer furniture comes either fully assembled at the factory, or in kits that the consumer must assemble himself.

The kits—referred to in trade lingo as knocked down (KD)—are obviously less expensive. You pay less freight on a smaller carton than you would for the bulkier assembled unit, and you don't have to pay for all the labor since some of it is your own. The components come in a compact carton complete with easy-to-follow directions.

Some very attractive designs come knocked down, but in general, KD tables and desks have simple, contemporary lines. They have to be uncomplicated so that even the least handy consumer can assemble them with ease.

Sorting It Out

The furniture business is very competitive. There are very few trade secrets that are worth much. Consequently, prices tend to be competitive at all times. You can expect to get what you pay for in the way of materials and methods of construction.

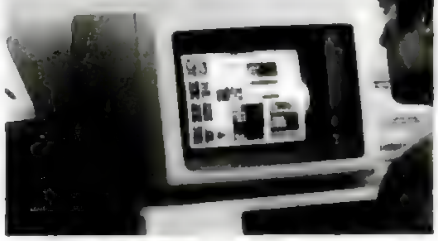
Furniture is also a fashion business. If you see something you really like and it suits your applications, buy it. If you don't like what you see, keep looking. Furniture is too expensive to change on impulse. You may have to live with what you buy for a long time to come. —C.W.S.

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THE MODULAR work station allows you to customize the layout of the furniture itself to reflect your unique work space and hardware requirements.

alone. When you group several modules together, there tends to be a duplication of structures that would not have occurred had the entire work station been built as one piece. For this reason, a modular furniture system tends to cost slightly more than a similar-size one-piece desk.

Modularity extracts a certain toll in styling as well. The sides are universally of straight lines to allow the various units to be connected. Overhanging tops and projecting plinth moldings must be sacrificed. Thus, modular units are overwhelmingly contemporary in style. This is fine if the rest of the furnishings in the room are modern, but may not coordinate well with more traditional surroundings.

Most office furniture is placed in the open center area of the room. Most furniture in our homes is placed along the



Bush Industries specializes in modular computer furniture. Shown here is a full-sized desk that can comfortably hold a video monitor, keyboard, disk drive, and even a printer. The hutch unit is a separate module.

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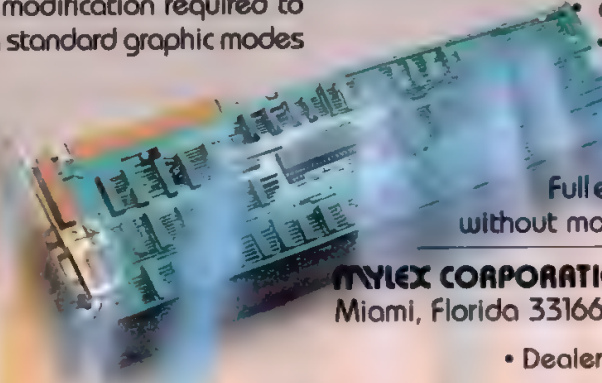
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walls. Since modular furniture is primarily designed for the office environment, modular groupings are often too big to fit comfortably in the home.

Placing modular units along a wall often can limit their usefulness. For example, the outfeed of a printer usually is caught by a wire basket mounted on the back side of the printer unit. There is no room for this basket if the printer stand is set up against the wall.

Modular groupings allow you to have a substantial amount of hardware out in the open where it is convenient to use. But this accessibility can simultaneously pose a security problem. Anchor Pad International, in Marina del Rey, California, makes locking hardware mounts to reduce the chance of theft.

The one-piece computer desk normally is designed to house a fairly simple computer system (monitor, printer, keyboard, and CPU), and not much more. The design is basically a compromise to accommodate the professional user and the recreational user. The equipment is all in close proximity, but in order to keep the size and price down, the amount of spare workspace is quite limited.



This traditional-styled roll-top desk from Riverside Furniture Corporation features a sliding panel that conceals the drop-lid keyboard compartment and a printer tray that slides out on heavy-duty casters.

THE one-piece computer desk normally is designed to house a fairly simple computer system.

Computer desks are available in a wide range of styles and prices. The small and contemporary Bush Model CT130 costs $169.95, while the elaborate genuine oak and pecan roll-top desk (#775) by Riverside Furniture Corporation is listed at about $1,760.

One-piece desks are sometimes mounted on casters to allow for portability. This feature can partially offset the work space limitation by allowing you to move it beside a table while working on a big project or over by the large console

Computer Furniture Sources

If you're not satisfied with the selection or service at your local furniture or computer store, you can get in touch with the manufacturers or distribution outlets listed below.

Manufacturers

American Furniture Co., Inc.
Hairston St. off Starling
Martinsville, VA 24115
(703) 632-2061
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Artech Industries, Inc.
55 West 14th St., #15C
New York, NY 10011
(800) 645-2287
CIRCLE 623 ON READER SERVICE CARD

Atlantic Cabinet Corporation
P.O. Box 100
Williamsport, MD 21795
(301) 223-8900
CIRCLE 622 ON READER SERVICE CARD

Bassett Furniture Industries
Hwy. 257
Bassett, VA 24055
(703) 629-7511
CIRCLE 621 ON READER SERVICE CARD

Bush Industries
312 Fair Oak St.
Little Valley, NY 14755
(716) 938-9101
CIRCLE 620 ON READER SERVICE CARD

CFC Computer Furniture Company
P.O. Box 2663
Chapel Hill, NC 27514
(919) 967-8104
CIRCLE 619 ON READER SERVICE CARD

CompuStand
P.O. Box 5216
Sherman Oaks, CA 91413
(213) 981-9279
CIRCLE 618 ON READER SERVICE CARD

Computer Furniture and Accessories
515 W. 132nd St.
Gardena, CA 90248
(213) 327-7710
CIRCLE 617 ON READER SERVICE CARD

Decar Corporation
Box 188
Middleton, WI 53562
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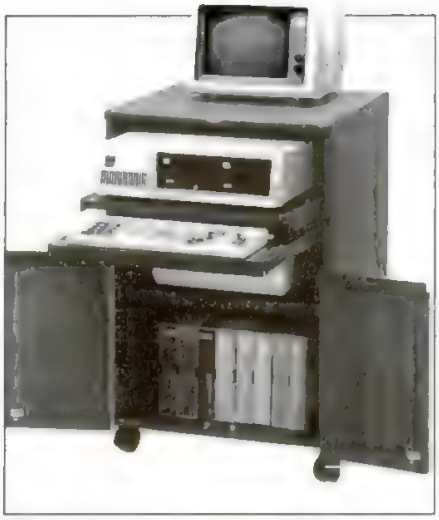
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television while playing computer games.

Several manufacturers make furniture that is somewhere between the modular system and the one-piece desk. These pieces don't have quite the unlimited flexibility of the modular work stations but offer more work space than the one-piece desks. Many of the real-wood designs, such as models by FineTech Furniture, Inc., of Woodbury, Tennessee and Wood Works, Inc., of Lawrence, Kansas, fit into this category. As you would expect, these desks carry price tags between those of the minimal desks and the modular systems.

The *computer cart* is designed to allow occasional use by several people. Mounted on casters, the carts easily can be moved around. They also close up and lock to secure both the hardware and the software. Wires are fully concealed.

This strong emphasis on function suggests that designs such as the CompuCart (Versa Tec Corporation, Tampa, Florida, from $595) and the new IBM Synergetix Personal Computer Workstation ($850) are aimed at an office market. Both models are small enough for home use, and both are offered in optional wood-grain finishes to mute the high-tech lines.



The CompuCart by Versa Tec Corporation of Tampa, Florida was probably the first cart-type computer work station designed specifically for the IBM PC.

THE computer cart is designed to allow occasional use by several people.

Cabinet units are designed primarily with appearance as the top priority. A typical cabinet will be about 5 feet tall and include closing doors to hide all the equipment when it is not in use. These units hold about the same amount of equipment as the desks, and share their lack of work space.

One of the first computer cabinets on the market was the O'Sullivan CT740 ($499). New models will soon be introduced by several other companies. Prices will range from about $270 to $1,500.

Electronic Systems Furniture
17129 S. Kingview Ave.
Carson, CA 90746
(213) 538-9601
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FineTech Furniture, Inc.
P.O. Box 280
Woodbury, TN 37190
(615) 765-5021
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Gusdorf Corporation
6900 Manchester Ave.
St. Louis, MO 63143
(800) 325-3622
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IBM Systems Supplies Division
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(201) 329-7000
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(800) 223-5594
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Information Systems, Inc.
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(415) 663-8262
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Kustom Kreations
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Northridge, CA 91324
(213) 886-8383
CIRCLE 608 ON READER SERVICE CARD

Lifeline Information Systems, Inc.
P.O. Box 766
Sandy, UT 84091
CIRCLE 607 ON READER SERVICE CARD

Modular Office Concepts
945 Industrial Pl.
El Cajon, CA 92020
(714) 442-0292
CIRCLE 606 ON READER SERVICE CARD

Myrtle Desk Co.
Taylor and Millis
High Point, NC 27261
(919) 885-4021
CIRCLE 605 ON READER SERVICE CARD

O'Sullivan Industries, Inc.
19th and Gulf Sts.
Lamar, MO 84759
(417) 682-3322
CIRCLE 604 ON READER SERVICE CARD

Old Time Shop
3315 Breckenridge Dr.
Houston, TX 77066
(713) 537-5816
CIRCLE 603 ON READER SERVICE CARD

Radio Shack
300 One Tandy Center
Fort Worth, TX 76102
(817) 390-3300
CIRCLE 602 ON READER SERVICE CARD

Riverside Furniture Corporation
P.O. Box 1427
Fort Smith, AR 72901
(501) 785-6000
CIRCLE 601 ON READER SERVICE CARD

Since the cabinet format is essentially dedicated to the small-system and occasional user, it is designed for use as a stand-alone piece, allowing greater latitude in the application of esthetic features. Overhanging top edges and heavy plinth moldings are possible, and when combined with wood frame-and-panel doors, they can harbor your state-of-the-art IBM-XT system behind an eighteenth-century armoire front.

But the cost of the cabinet-style work station is high. You may have to pay from 50 to 100 percent more than you would for a comparable-quality computer work station that holds the same equipment.

For many home users, however, the price is secondary. "Sometimes people don't want furniture that looks as if it just came off a space ship," observes Daniel Durante of FineTech.

Award-winning computer-furniture designer Dan Droz agrees. "Function is important. But as you bring technology into the home, you have to counterbalance the 'tech look' with something more human." User-friendly furniture for your particular set-up is out there, even though you may have to do a little shopping around to find it. You can probably look forward to more style-specific designs joining the market. How about an Art Deco work station? A Louis IV module? For the country home, maybe a Shaker-style cabinet? /PC

PEOPLE don't want furniture that looks as if it just came off a space ship.



This computer stand won furniture designer Dan Droz, of Dan Droz & Associates in Pittsburgh, Pennsylvania, the Daphne furniture design award. The design is manufactured by Taylor Woodcraft of Malta, Ohio.

Carl W. Spencer is the owner of Presidential Industries, a manufacturer and retailer of production and custom electronics furniture in Riverside, California.

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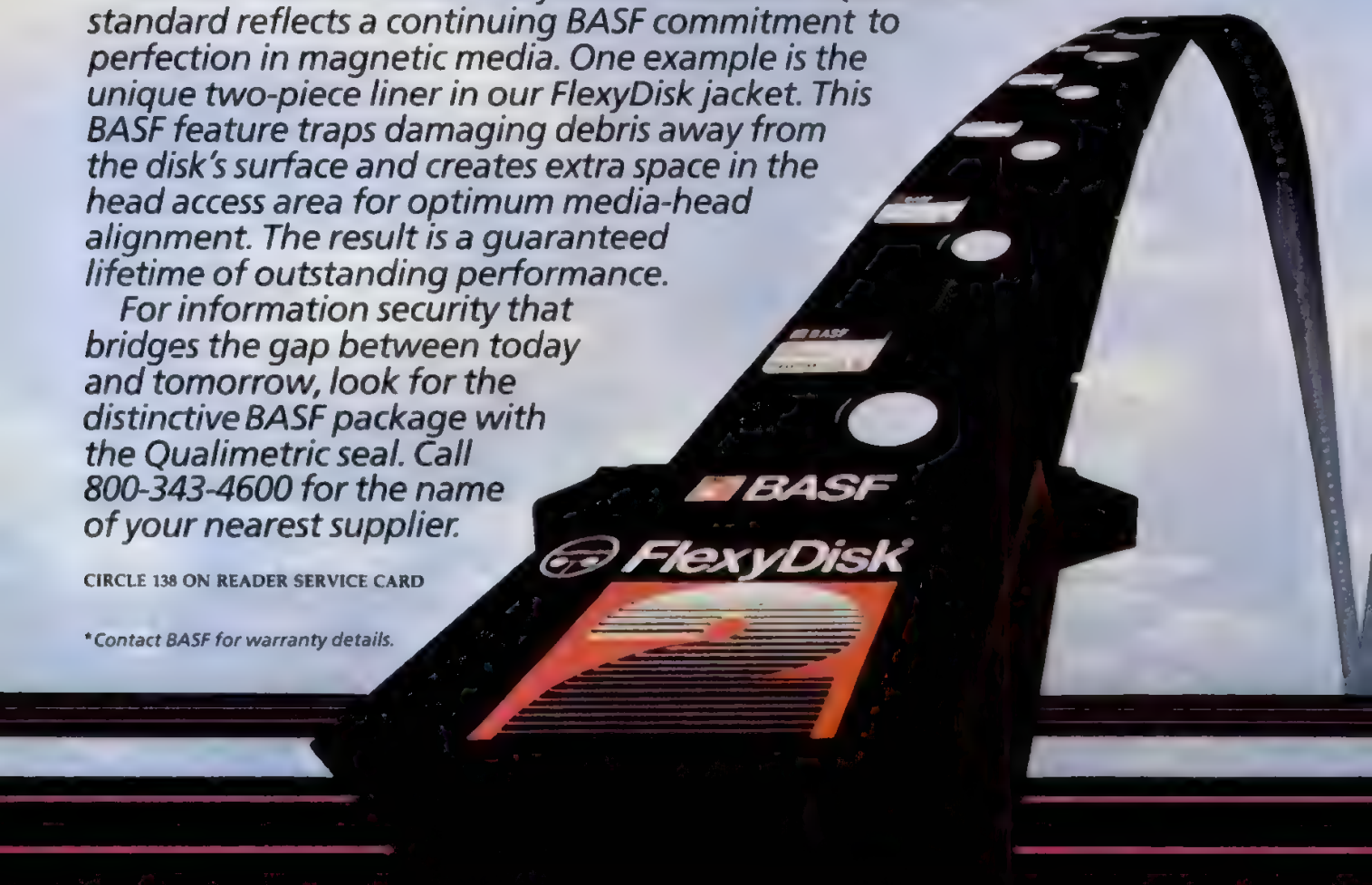
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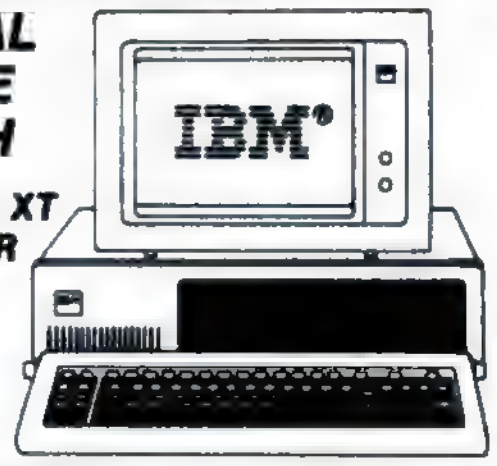
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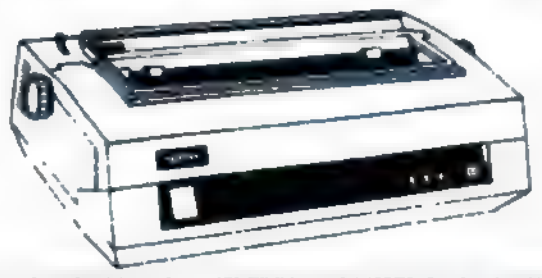
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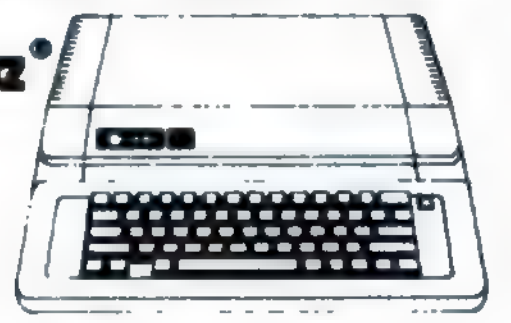
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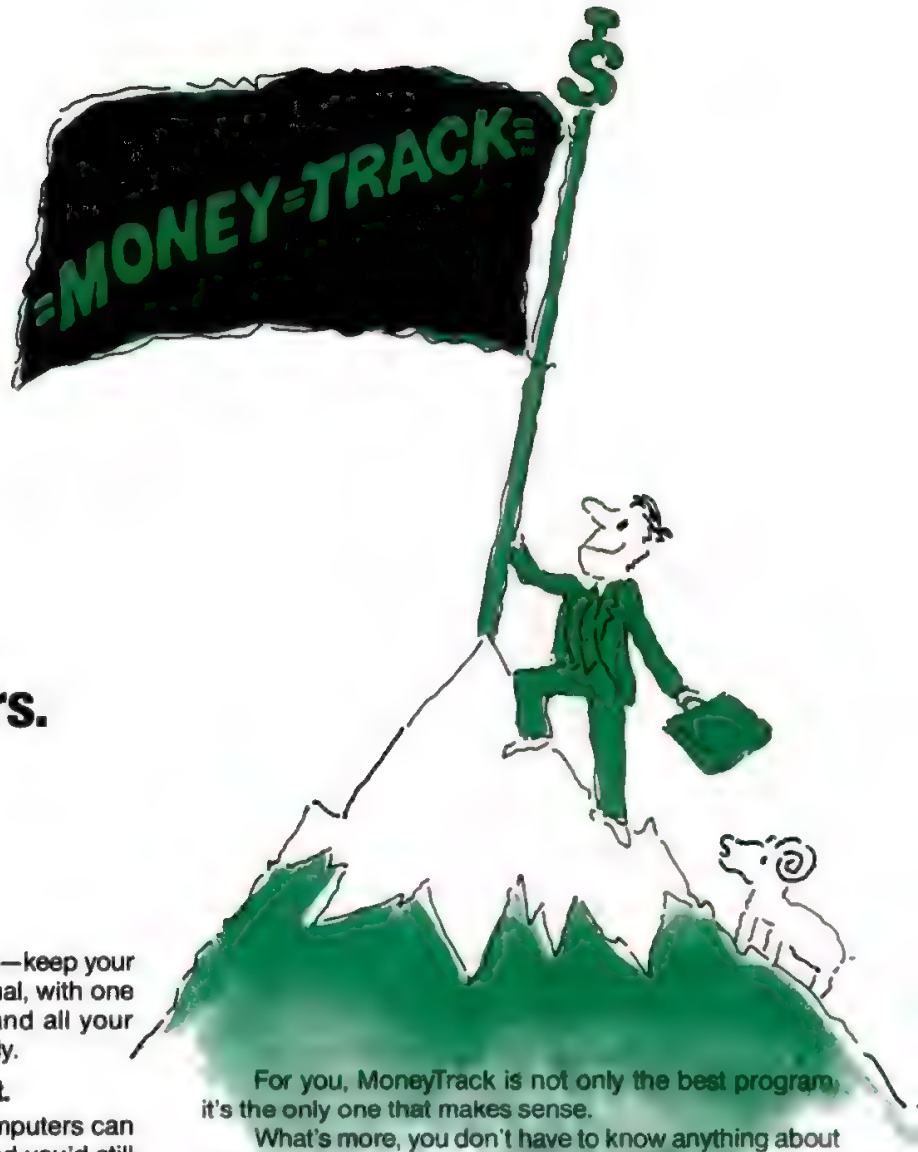
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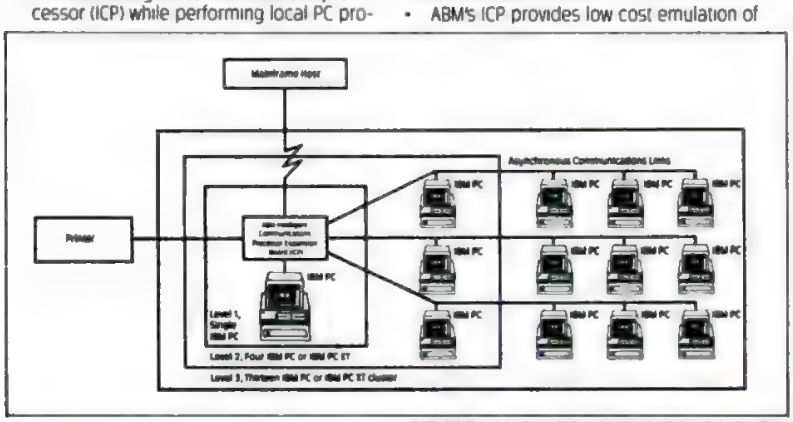
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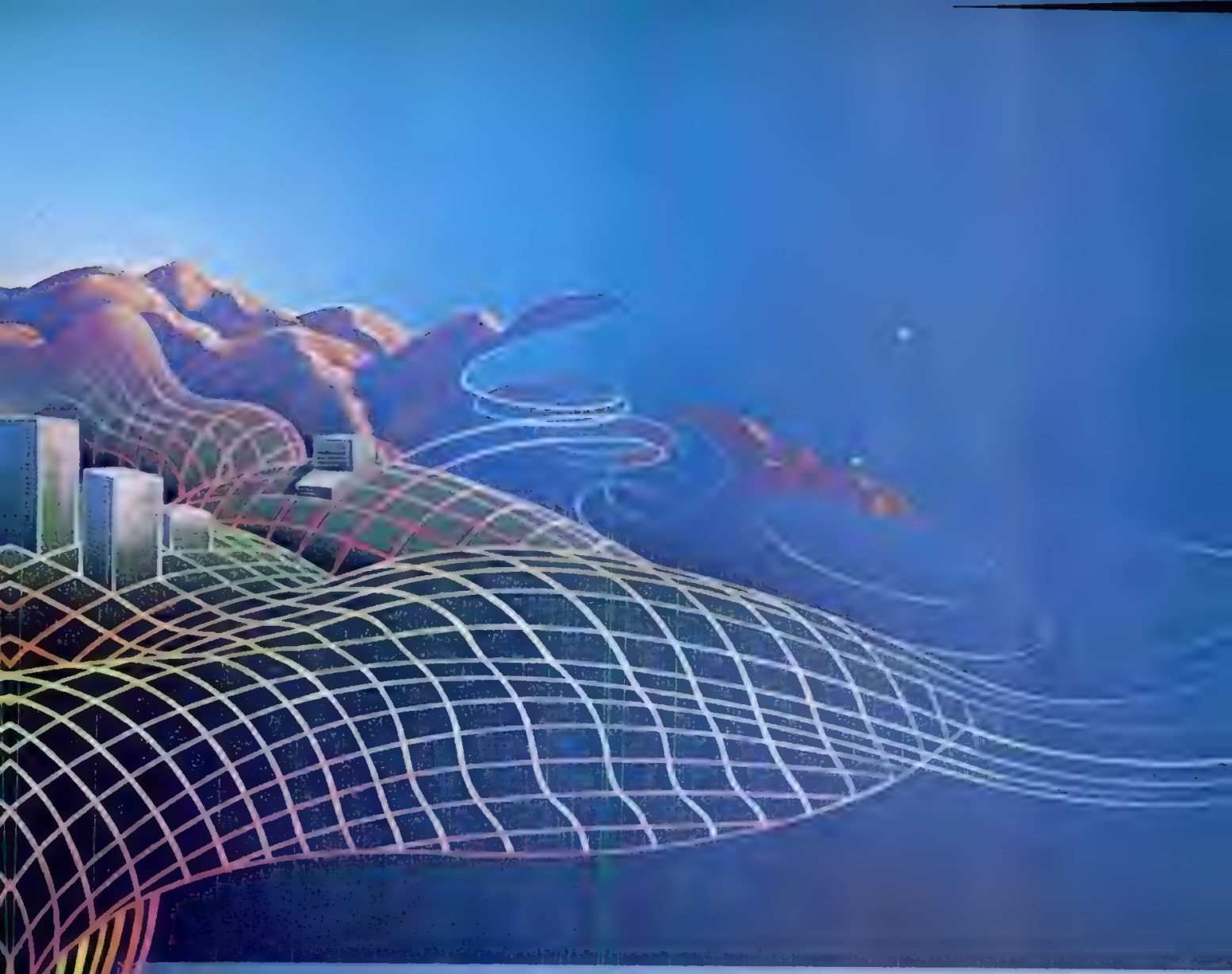
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The CONO-COLOR adapter gives you more.

The CONO-COLOR adapter also offers a light pen interface with resolution improved to 1 pixel, wrap-around panning, hardware scrolling, high-speed erase, and dual character fonts. Up to four selectable pages of video memory let you modify other pages while one is being displayed—and then switch instantaneously to a new page.

The CONO-COLOR adapter's triple-ported memory and 32-bit wide interface to the CONO-GEN module lets the adapter receive data concurrently from the IBM PC's 8088 microprocessor and CONO-GEN, at data rates exceeding 14 megabytes per second.

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MARKETPLACE/LISA HARBATKIN

Most mail order transactions are problem-free, but if you're thinking of ordering a computer product through the mail, be aware of the potential price of your discount.

Mail Order & Disorder

A soldier stationed in California saw an ad offering the exact system he'd been dreaming of, right down to the software. He called the retailer in New York and plunked down his $3,543 via credit card.

Several months later, when the long-awaited package turned up in his Army Post Office box, the soldier noticed that several components, including the software, were missing. Letters flew back and forth between New York and California. The retailer put a tracer on the disk drive, which had been delivered, but not on the software.

After another long round of correspondence, the company abruptly proclaimed that the software was not part of the package. By this time, the soldier had already turned to a number of third parties, including the local consumer protection agency. A year later he still didn't have his software, and the consumer agency was still trying to resolve the problem.

Another case in point. A computer novice outside of Phoenix decided, after doing some research, to get an IBM PC. The configuration he wanted was available from a mail order house in California for $500 less than it cost at his local dealer. Taking into consideration his inexperience with computers and his probable need for support and advice, he decided to buy from the store in his city.

When, as generally happens, the novice ran into a problem he couldn't solve on his own, he went back to the dealer. The staffers were friendly and eager to help, but they couldn't work it out either, even after calling IBM. After about 2 weeks, he concluded that the staff knew no more about his problem and how to solve it than he did. He finally worked out a solution with the help of a programmer friend.

A Hard Decision

Our suburban PC buyer's difficulties show that local purchase doesn't necessarily assure trouble-free solutions to computer problems. But what about the alternatives? Should you order by mail or not? Mail order generally ranks high on the list of consumer complaints—it's right up there with car purchases and home repairs. The good news is that spot checks with consumer affairs departments, state attorney general offices, and postal inspectors in several key areas have turned up few complaints regarding orders for computer equipment and software. (The complaints reported to various agencies to date involve dollar values ranging from $35 to well over $3,000). But this whole business is relatively new and rapidly expanding, so there's little doubt that the number of complaints will increase as more people take advantage of mail order for price breaks.

While computers are not yet a significant category in mail order complaints, you should be especially cautious when ordering anything, especially computer hardware or software, by mail. The whole area of high-tech mail order is uncharted territory in terms of the potential problems and the protection available.

Advantages and Disadvantages

Clearly, the main advantage of choosing to buy through the mail is lower prices. And if your local dealer doesn't stock the item you want, you may have no choice but to resort to mail order. Computer equipment is a high-ticket field, and obviously, higher dollar outlay means

higher risks. Keep in mind that with many products, including those manufactured by IBM, what you save in price you pay for by giving up a company warranty. "For the most part, consumers look at price, then product, then warranty," said Sally Browne, director of government and consumer affairs with the Electronic Industries Association (EIA), an industry trade group. "But the warranty is really part of the purchase price. You can't say, 'Gee, I didn't read the small print.' "

THE PC warranty is provided solely through authorized IBM retail dealers.

IBM's opposition to mail order and its refusal to sell to mail order dealers is based on its view of the warranty and support issue.

"There's only one disadvantage, and it's the biggest: Whom do you turn to when you have to service the machine?" asked IBM spokesman Dan Scherer. "You'll never get service from the dealer. The only safe way to buy a machine is with a 90-day warranty. I haven't seen any evidence that mail order houses provide one."

The PC warranty is provided solely through authorized IBM retail dealers. Service is provided directly by the dealership if it is an authorized service center or one of the more than 100 IBM Customer Service/Exchange Centers run by the Customer Service Division. There is no way to get the IBM warranty if you've bought your machine through a mail order house. Even if the mail order vendor buys his machines from an authorized IBM dealer or distributor (a common practice), "an authorized dealer can't transfer the warranty to another dealer," Scherer said.

Theoretically, if you bought your brand new PC from an unauthorized dealer, by either mail order or walk-in, and you can come up with the original bill of sale (the bill from the authorized source that sold your machine to the unauthorized vendor), you can walk into any IBM service center and say, "Cover me under the 90-day warranty." But the chances are slim that you can acquire the original bill.

Alternative Service

You might try another option. IBM Service/Exchange Centers sell maintenance or service contracts. These cost from $40 to over $400 a year, depending on which pieces of the system you want to cover and whether you opt to bring the equipment in yourself or have it picked up by a courier. But before selling the service contract, the Center requires that you bring in the machine for a full run of diagnostic tests for $40 to make sure that nothing is wrong with it.

Some mail order dealers provide their own, non-IBM service agreements as part of the sale. Check it out. Also check on whether the service is available locally or whether you'll have to ship the machine to get the service. If you do have to ship it, who pays the freight charge? Does the agreement cover damage during shipment? A bad bounce during shipment could knock loose some connections or crack the CRT.

And what about support? What if you can't figure out how to do a hook-up? A hot line for installation problems and for advice in getting a program to run can be of some help. But not always. Consider, too, that a local dealer might not want to provide support to someone who bought the equipment elsewhere.

Dealer Friendly

If you buy a PC out of town, it's a good idea to get on friendly terms with the authorized IBM dealer in your area. One PC owner recently ran into a problem getting his printer to work in phase with the machine. He had bought the cable from a local dealer, but the dealer was unwilling to help because he hadn't sold the PC. Eventually the annoyed customer, a professional programmer who had bought his PC from the dealer who supplied his employer, figured out that the problem was the position of a single switch. Despite the convenience of having a nearby supply source, he was in no mood to go back to the local shop, except perhaps to explain to the dealer that he's being very shortsighted.

If you run into this kind of problem, remember that in the current marketplace, computer dealers are making most of their profit in the so-called "aftermarket" of peripherals, supplies, and software—not on the first equipment sale. It's really to the advantage of the dealer to provide you with support. If he's uncooperative because you didn't get your hardware from him, you may or may not want to bother explaining what a significant aftermarket potential you represent. Any smart dealership should be more than glad to have your post-computer purchase business.

Inefficiency and Fraud

Despite the possibilities, few equipment condition problems are being reported by mail order customers or by computer buyers generally. Solid state components, of course, tend to have low breakdown rates, and are probably safer to order by mail than a piece of pottery.

So, what else can go wrong? Outright mail order fraud, experts agree, is rare. The authorities are quick to respond and, in any case, fraudulent sellers do not usually stay in business long. The biggest problems in the mushrooming computer products area are results of simple inefficiency. A new vendor might have insufficient stock to fulfill all the responses to an ad, for example.

The Boston Mayor's Office of Consumer Affairs and Licensing recently interceded with a local merchant to help a Canadian customer who had ordered a peripheral by mail and not received it. He'd written letter after letter to the company, using his dot matrix printer. The company apparently wasn't rea ling its mail and consigned all his letters to its junk pile of dot matrix epistles. The problem was solved in a few days once the agency called the retailer. This tactic solved one

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☐ Master Card ☐ Visa ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiration Date: _____

Signature: _____ *(required for charge orders)*

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PCM 12

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CIRCLE 296 ON READER SERVICE CARD

consumer's complaint. Whether it inspired the company to review the rest of its letters is unknown.

Many mail order houses do such a high volume of business that a certain number of orders is bound to go astray. Many cottage industry software suppliers get swamped with orders that far exceed their expectations. Although it's never pleasant to be the victim of a mix-up, such problems can often be worked out amicably between customer and dealer.

More serious are the genuinely questionable business practices. In mail order generally, these include bait-and-switch tactics, late delivery or failure to deliver at all, damaged or missing items, and unsubstantiated or fraudulent advertising.

As low as the number of complaints specifically regarding computer equipment has been, it already includes cases of most of these abuses.

High-End Micros by Mail

Many microcomputers ordered by mail (aside from such products as the Timex-Sinclair) are sophisticated and powerful machines with 48K and up. People buying these are also more sophisticated; they know what they expect to get and what to do with it. They can do many of their own repairs, or have access to people who can do them.

If people less familiar with computer equipment haven't done enough research, there's a good chance that they'll get either more or less than they expected when their packages arrive. And they'll probably need more support than is generally available to mail-order customers.

In calculating your outlay in dollar terms, try to factor in how much time and effort it will take to get service for the machine and support for yourself. Will the effort be worth the difference in price? For non-IBM products, is the warranty available to mail order purchasers?

Look Before You Order

All these considerations dictate a real need for caution and a lot of shopping and thinking before you place your order. Yes, the chances are that nothing will go wrong. But the best odds are guarantees. The careful buyer can improve the chances of satisfaction.

To begin with, keep in mind the maxim recited by every consumer affairs specialist in every local, state, and federal agency: If the pitch seems too good to be true, it probably isn't. Modified for mail order, the old saw might go something like this: If prices are much lower than at other mail order merchants—watch out!

Before placing a mail order, research both the product and the merchant. If possible, go shopping locally to compare prices. Are you really saving that much through the long-distance transaction? Can you bargain with a local dealer to get your coveted program or peripheral within range of the mail order prices?

CONSUMERS have responsibilities as well as rights. They start when you're thinking about buying, not after you've bought.

Of course, if what you want is just not available in your area (and this can be true of many software packages), you will have to resort to the mails. But even if the product is not available locally, check carefully. Find out as much as possible about what you're ordering; know exactly what you should be getting.

Be especially careful to make sure, when ordering software or peripherals, that what you're buying is compatible with the system you have. If you make a mistake, or if you just decide when the order arrives that you don't want it, you'll have a harder time getting your money back, and getting third parties to support you, than you will if there are genuine questions of nondelivery or damage.

Then consider your own level of expertise. Will you need a lot of support? Will the manuals and the answers provided by hot lines be sufficient to get you started and keep you going? Or would you be more comfortable having a friendly neighborhood dealer available to help you?

"Consumers have responsibilities as well as rights," asserted the EIA's Browne. "They start when you're thinking about buying, not after you've bought."

Checking Up on the Vendor

Researching the equipment is probably the easiest task you'll have. Once you've decided what you want, or when you see an ad offering a product you're interested in, get busy and check out the company you'll be ordering from.

Where is it located? Some states and localities have especially strong consumer protection legislation, much of which supplements and even exceeds the already strong federal laws and regulations. Strict laws and rules in some jurisdictions cover everything from how the mail order transaction is to be conducted to provision for paybacks in at least some cases of nonperformance on the part of the vendor. California, Massachusetts, and New York, plus most of their major cities, have some of the strongest consumer protection laws in the country. Since many of the major high-tech vendors are located in these states, there's a general level of protection already built in. Remember, too, that whether you're ordering from a retailer or directly from a manufacturer, the same laws and regulations apply.

But don't stop there. Get in touch with the consumer affairs department and the Better Business Bureau in the vendor's area. The chances are it will be able to provide considerable information on a particular company. Find out how many complaints there are against the merchant. (Many agencies will take action only after receiving a significant number of complaints against a particular firm.) Is the merchant in good standing with the local Better Business Bureau? What is the nature of any outstanding complaints? If the local watchdogs have never heard of the firm in question, proceed with caution.

Next, get in touch with the vendor. Examine the retailer's ads carefully. If there's an 800 number, call it several times. See if your questions get the same answers from different people at the other end of the line. Get an exact description of the product or system that will be sent to you. Don't order from a photograph; be sure the product you order is exactly what you want. And don't forget to ask about policy on returns and refunds.

Don't send your money to someone who does business only out of a post office box. A legitimate retailer may indeed prefer having orders go to a postal box, but it

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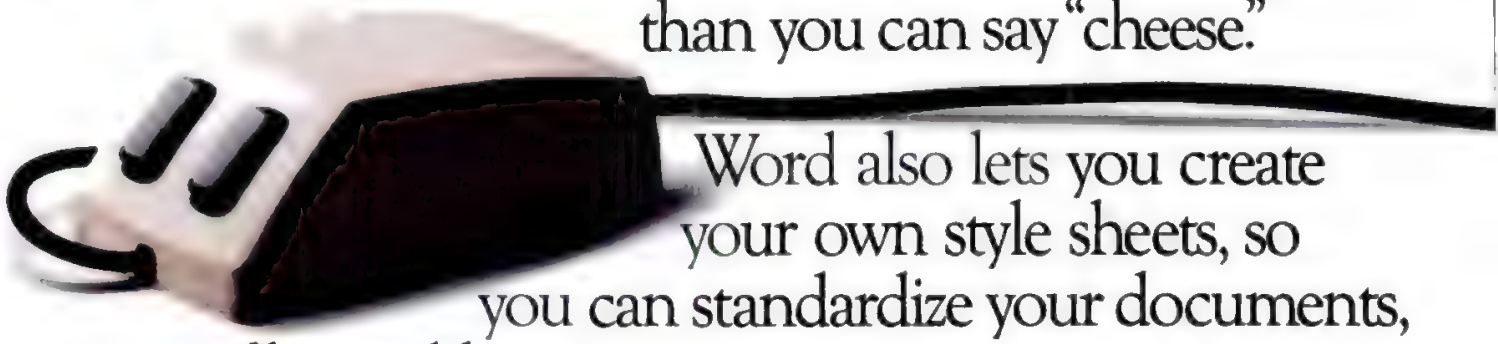
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should include the street address as well. Another important caution: Don't order from a mail drop with a street address; these operations are a major source of fraud problems. Admittedly, this isn't always easy to check. Finally, be suspicious of a company that has no phone listing or doesn't answer phone calls.

If the vendor checks out on all these points, you still might want to be especially cautious if you're planning a major purchase. It might be a good idea to start small and place a minor order first, just to see how efficiently and honestly it's handled.

"None of this is any guarantee," commented Karl Lauby, vice president of operations for the Better Business Bureau of Metropolitan New York. So, in placing the order, continue with caution. Keep all records, from the advertisement to all bills, canceled checks, order forms, and correspondence. Keep records of the date you ordered the product(s) and of the scheduled delivery date.

Your Mail-Order Rights

According to FTC Mail Order Rules (Part 435, CFR Title 16), you must receive mail ordered merchandise within the time period specified by the seller. If the vendor hasn't specified a time period, it must ship your order no more than 30 days after receiving the order. You have the right, under the rule, to cancel and request a refund if you don't get the merchandise within the required time. The company must notify you in the event of a delay in the delivery date and give you the option of canceling the order and getting a full refund or agreeing to the new date. Keep in mind that if you fail to respond to the first notice of delay, the seller can assume that you are accepting it. If there are additional delays, however, the company must obtain your express consent.

If you opt to cancel, the company must return refunds on prepaid merchandise inside of seven business days and adjust a credit card account within one billing cycle. The rule does not apply to credit purchases where your account is not charged until the merchandise is mailed or to COD orders.

IF JUST ONE piece of paper or one item travels by U.S. Mail, you can use the Postal Inspection Service as a recourse in case of a problem.

The Mail Order Rule was issued in 1975, largely in response to an overwhelming incidence of nondelivery. Recent computer product mail order problems also involve nondelivery of ordered merchandise. They include two cases in the Los Angeles area involving software and blank media.

These may well turn out to be results of what Postal Service lawyer George Davis, assistant general counsel in the Consumer Protection Divison of the Law Department, calls a "schlocky operation run by someone who can't handle what he's getting into. "Most often," Davis noted, "deliberate fraud is not the problem. It's more likely that the seller just ran out of supplies."

Postal Inspection

It's probably a good idea to have at least a part of a long-distance transaction go through the mails. If just one piece of paper or one item travels by U.S. Mail, you can use the Postal Inspection Service as a recourse in case of a problem. Even private carriers like the United Parcel Service have complaint and problem-resolution procedures. But the Postal Inspectors have

Consumer Protection References

If something goes wrong with your mail order, these agencies may help you make it right.

• If you ordered from a firm located in New York City, Boston, or California, contact one of the following consumer protection agencies:

Complaints Division
Department of Consumer Affairs
80 Lafayette St.
New York, NY 10013

Boston City Hall
Office of Consumer Affairs
Boston, MA 02201

Department of Consumer Affairs
Complaint Assistance Unit
1020 N St., #579
Sacramento, CA 95814

• Otherwise, your best bet is at the local level. Try contacting the consumer protection agency in the area where the business is located.

• The Postal Inspection Service has an effective mediation service. Your local postmaster or inspector will be able to provide the address of the inspector in charge in the vendor's area.

• You can obtain the address of the Better Business Bureau in the vendor's area by writing to:

The Council of Better Business Bureaus
1515 Wilson Blvd.
Arlington, VA 22209

• This agency deals specifically with mail order complaints:

Direct Mail/Marketing Association
Mail Order Action Line
6 East 43rd St.
New York, NY 10017

• If you charged your order to a credit card and you're not satisfied with the action taken by the credit card issuer, get in touch with the area or regional office of the federal enforcement agency that regulates the issuer of your card. Contact the Federal Reserve Bank for its member state banks. For national banks, contact the Comptroller of the Currency. For state-chartered banks, contact the Federal Deposit Insurance Corporation (FDIC). For most savings banks, contact the Federal Home Loan Bank Board (FHLBB). —*L.H.*

an impressive reputation for getting their man. Whether it's inefficiency or something more sinister, vendors are likely to want to resolve complaints after a call from the local inspector.

Another useful precaution is to use a credit card rather than paying by check. Once you've sent a check, you've paid But the credit card is only a promise to pay, and it puts an important layer of protection between you and the merchant.

Damage and Repairs

"If you're ordering by mail to save money," suggested Browne of the EIA, "it's a good idea to put the cash you're saving into an interest-bearing account of some kind. That way, if you aren't getting a warranty or a service contract, you can use the interest to pay for any needed repairs."

THE CREDIT card puts an important layer of protection between you and the merchant.

Once you get delivery of your order, open it immediately. Check for damages, and if you find any, keep all packaging. It could be important evidence. If the product is defective, the seller is liable. If the product is damaged or lost in shipping, you'll probably have to take it up with the shipper, although the vendor may make restitution or intercede for you.

Shipping problems could be the issue; in at least some cases they're not the seller's fault. As one postal inspector remarked, "We try to be careful. We don't just go on the attack. After all, we could have been the ones to have damaged it or lost it in the mail."

Consumer Protection

To a large extent you're on your own if you run into mail order trouble. Your first step should always be to contact the mail order firm. It's likely that it's just a mistake and you'll probably be able to resolve the problem with them. If this doesn't work, either because the company is inefficient or because it's really not on the level, the hard part of your job is just starting.

If any part of the transaction went through the mail, and possibly if you were responding to a mailed ad, your local postmaster or postal inspector will give you the name and address of the inspector in the vendor's area. There's a good chance that the Postal Service's Consumer Protection Program will be able to help you. This is a one-on-one mediation program with no enforcement powers. It is designed to let the inspector press individual cases, and like most of the other such programs at the local, state, and federal levels, it has a pretty good settlement rate—as high as 80 to over 90 percent in many parts of the country. If the problem can't be resolved through mediation, the case may be transferred to civil or criminal investigation, depending on the judgment of the inspector and the complainant's inclination.

Local and State Agencies

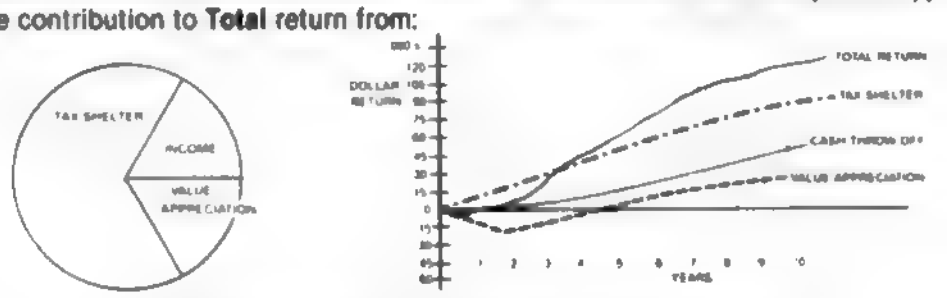
Consumers with mail order problems should also get in touch with local and state agencies in the vendor's area. Contacting your local consumer protection agency may also help, since staff members around the country may well know each other and be in touch on major cases. In general, consumer agency staffers seem to feel that your chances for success in resolving complaints improve the closer you get to home. Local—city, county, and state—agencies are more likely to be responsive than overburdened federal consumer bureaucracies. In many states, the attorney general's office and banking

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authorities have the power to obtain paybacks. "The mail statutes really aren't that helpful to people who've been cheated or who have lost money because there's nothing in them that enables us to require refunds," said Postal Service lawyer Davis. "Many of the state laws, however, can require repayment."

Massachusetts, for example, not only has a payback provision, but also a provision under its "Mini-FTC Act" that provides a procedure for the consumer or his attorney to follow when dealing with the vendor. Failure of the vendor to make restitution in 30 days allows the consumer to take him to court. The judge can order a settlement of up to three times as much as the difference between the vendor's settlement offer and what the judge determined was reasonable, plus the attorney's fees. New York also has some of the strongest pro-consumer laws in the country, and the state attorney general has frequently obtained restitution.

You always have the option of small claims courts, or high civil courts if you've spent more than the small claims court maximum. But even the price of a full-blown PC system is not likely to be enough to justify paying a lawyer's fee. And any recourse to the judicial system and the nonjudicial enforcement programs is likely to take longer than you'll want to wait. Your best bet is probably through the various mediation programs.

Your other best options are to contact the various private organizations that have consumer protection programs to make use of the protections offered credit card users through the Fair Credit Billing Act (FCBA). Private sources of help include the Better Business Bureau in the vendor's area, as well as the Direct Mail/Marketing Association, a trade group. In addition, if your problem started with an ad, contact the publisher of the magazine or newspaper where you saw it. Few may actually be able to help you, but they will certainly scrutinize a problem company's ads more closely in the future.

Using Your Credit Card's Clout

If you used a credit card for a problem purchase, take a good look at the complaint procedure outlined in the billing rights summary on the back side of your monthly statement. It's a good description of the extra help you can get from your card. But to get this protection, you'll have to follow through.

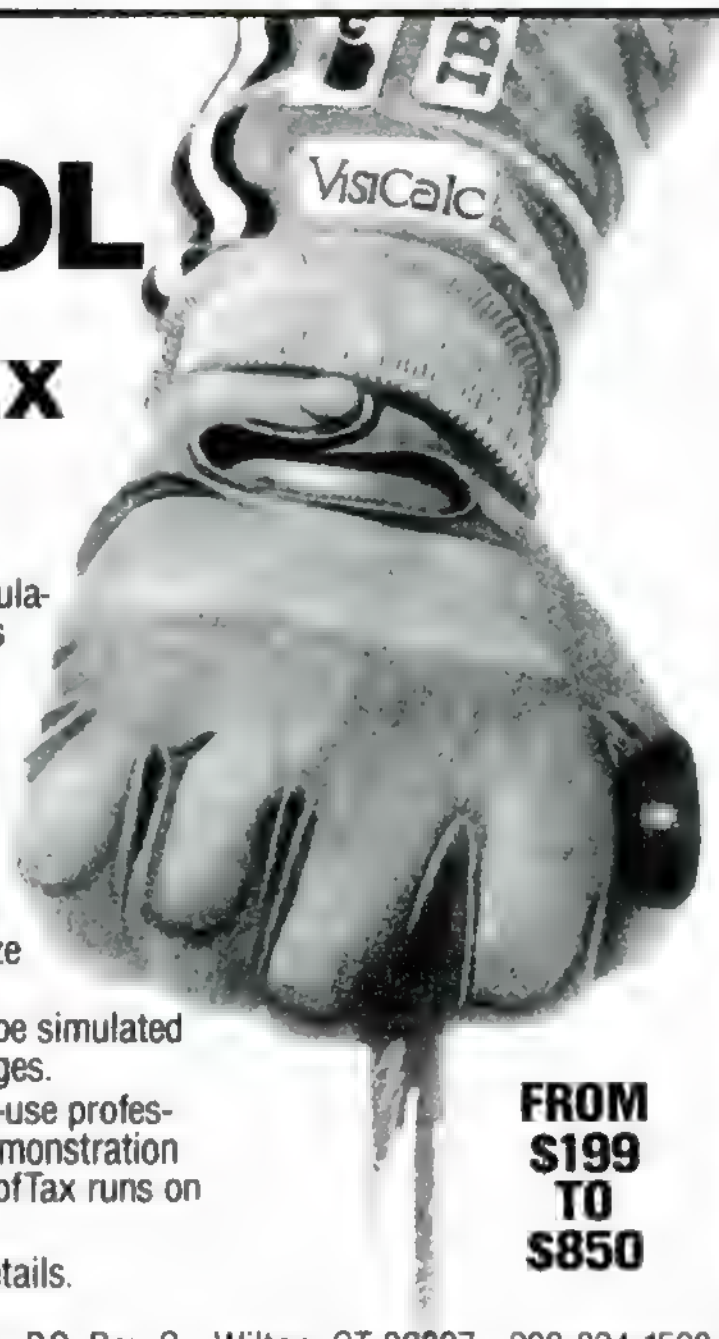
IF YOUR problem started with an ad, contact the publisher of the magazine or newspaper where you saw it.

To begin with, undelivered goods or services are one of the seven "billing errors" defined by Section 226.13 of the FCBA. The Act applies to all open-ended credit accounts, including bank and non-bank credit cards, revolving charges, and overdraft checking. By providing written notice to your card issuer, you can begin the complaint procedure, disputing that portion of your monthly bill, and withholding payment of the disputed amount. The FCBA settlement procedure calls for the card issuer to begin an investigation and to resolve the issue within two billing cycles or 90 days.

In real life, any of a number of things can happen, depending in good part on the card issuer and what its procedures are. These can vary greatly, even from bank to bank, within the Visa and MasterCard systems. American Express will probably undertake an investigation and press for a settlement, a spokesman said. Some Visa and MasterCard issuing banks will do the same. But some may simply charge back the retailer and leave you and the store to work the conflict out on your own. Interviews with a large number of issuers and government regulators indicate no clear pattern on what's likely to happen in a given case.

If your merchandise arrives damaged or isn't of the quality you expected, you also have recourse under the FCBA. But, where a high number of billing error dis-

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putes appear to be resolved in the consumer's favor, options and results under FCBA's Section 226.12(c), which covers special credit card provisions dealing with the quality of goods and services, appear to be less clear. The act's requirements that the purchase be at least $50 and that the transaction should have taken place in the cardholder's state of residence or not more than 100 miles from his address limits your recourse and maneuverability.

You do have some recourse against the card issuer, especially if your state law provides for it; the FCBA allows you to take the same action against the issuer that you could under state law take against the seller. But the provision as a whole is more difficult to use, and results are less satisfactory than with Section 226.13. One possibility, if you have a damage or quality dispute, is to try to get it redefined as a billing error. You can contend that a broken piece of merchandise constitutes nonfulfillment of the seller's agreement.

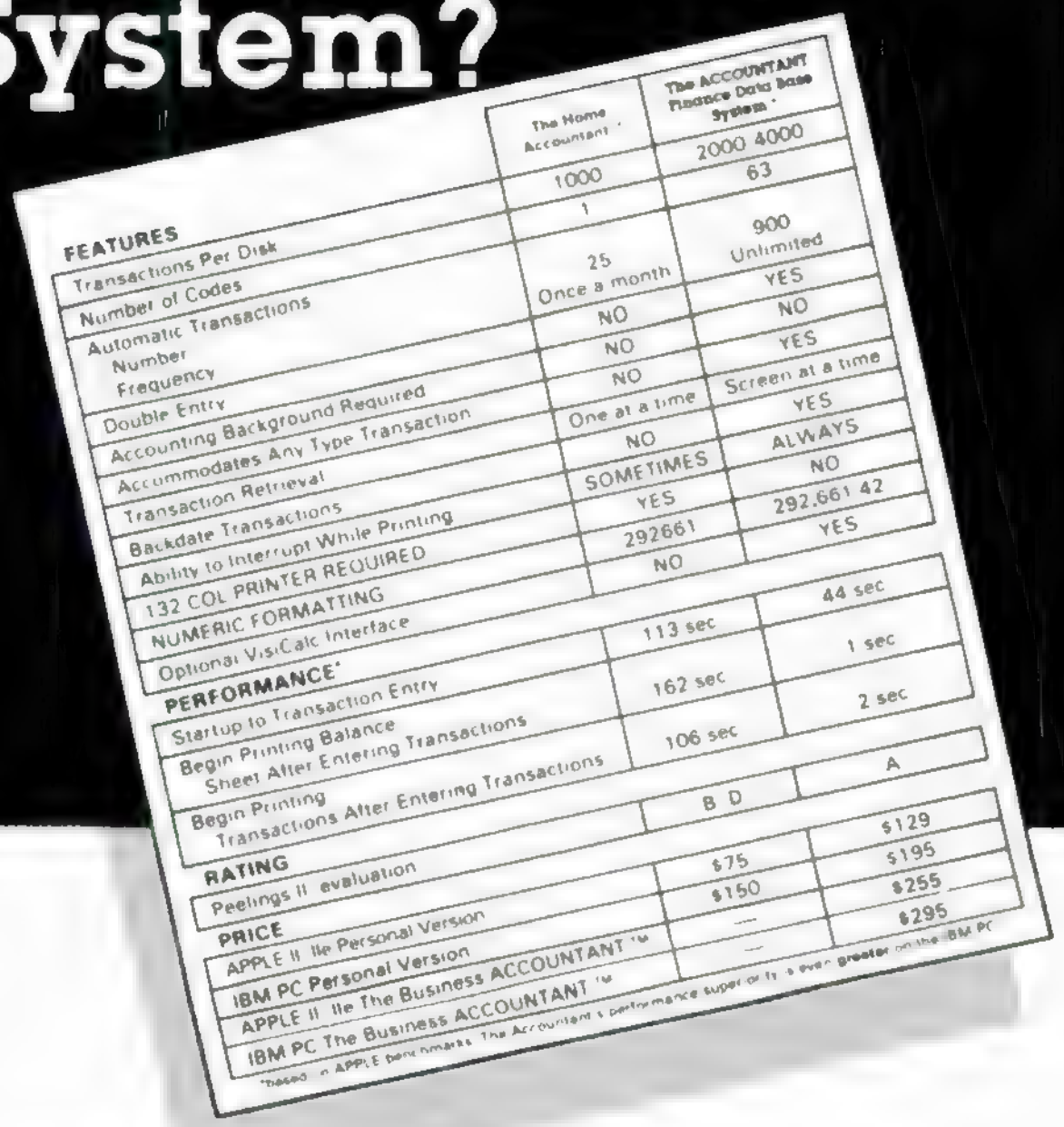
As a final recourse, if you're dissatisfied with the card issuer's resolution of your complaint, you can turn to the consumer protection department of the federal government agency that regulates the issuer of your card. This allows you to carry your dispute a step further and keep it alive longer.

However, you have to go to the right agency. This would be the FTC for problems with issuers of nonbank cards. While it may issue a written notice to the card issuer and/or the vendor involved, the FTC will not take enforcement or mediation actions for individuals.

On the other hand, the Federal Reserve (for state-chartered banks that are members of the Federal Reserve System) and the Comptroller of the Currency (for national banks) have mediation services for users of cards issued by these banks. So do the Federal Home Loan Bank Board, which regulates the savings and loans institutions; the Credit Union Administration; and the Federal Deposit Insurance Corporation, which oversees the state-chartered banks that are not Federal Reserve members.

What's the upshot of all this? You may find savings and satisfaction in a mail order computer purchase. But, as always, the final words of advice can only be *caveat emptor.* */PC*

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Accommodates Any Type Transaction	One at a time	Screen at a time
Transaction Retrieval	NO	YES
Backdate Transactions	SOMETIMES	ALWAYS
Ability to Interrupt While Printing	YES	NO
132 COL PRINTER REQUIRED	292661	292,661 42
NUMERIC FORMATTING	NO	YES
Optional VisiCalc Interface		
PERFORMANCE*		
Startup to Transaction Entry	113 sec	44 sec
Begin Printing Balance Sheet After Entering Transactions	162 sec	1 sec
Begin Printing Transactions After Entering Transactions	106 sec	2 sec
RATING	B D	A
Peelings II evaluation		
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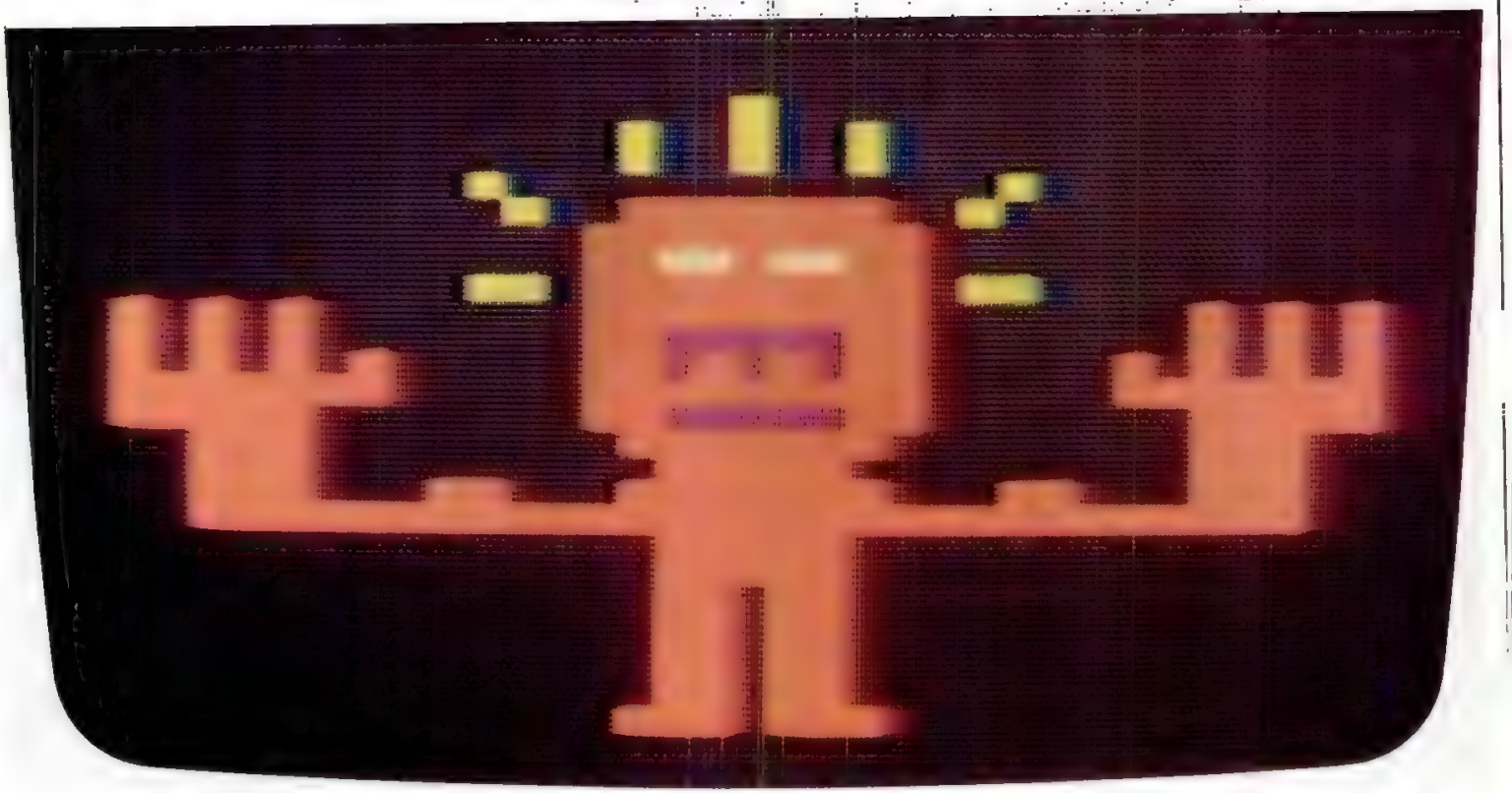
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AMDEK Color I Plus 13 Color 329
AMDEK Color II hi res RGB 438
AMDEK 310G Green 179
AMDEK 310A Amber 179
COMREX 5600 12 hi res amber 169
NEC 1201M 12 Hi res green 150
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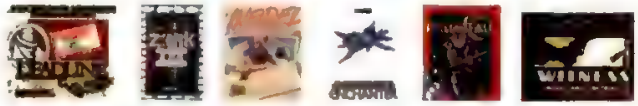
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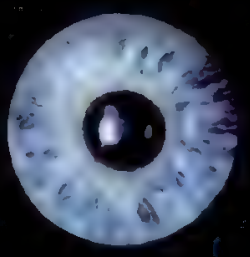
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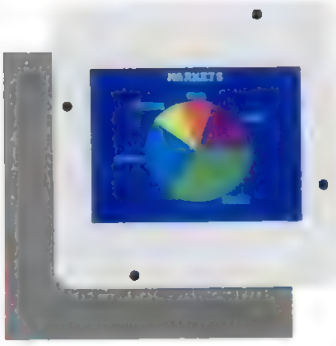


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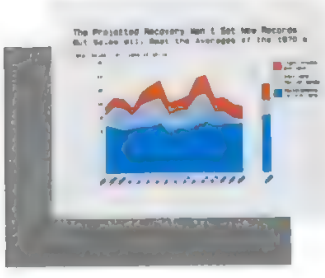
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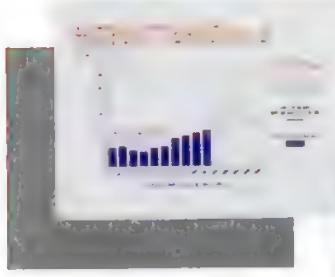
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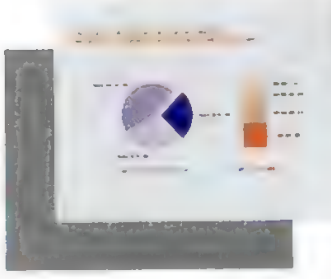
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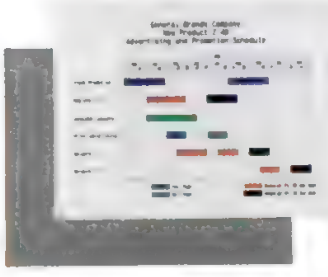


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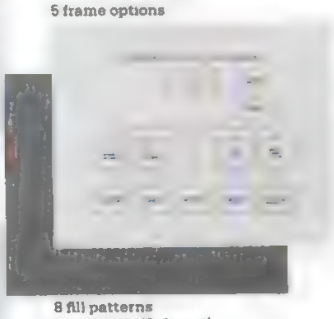




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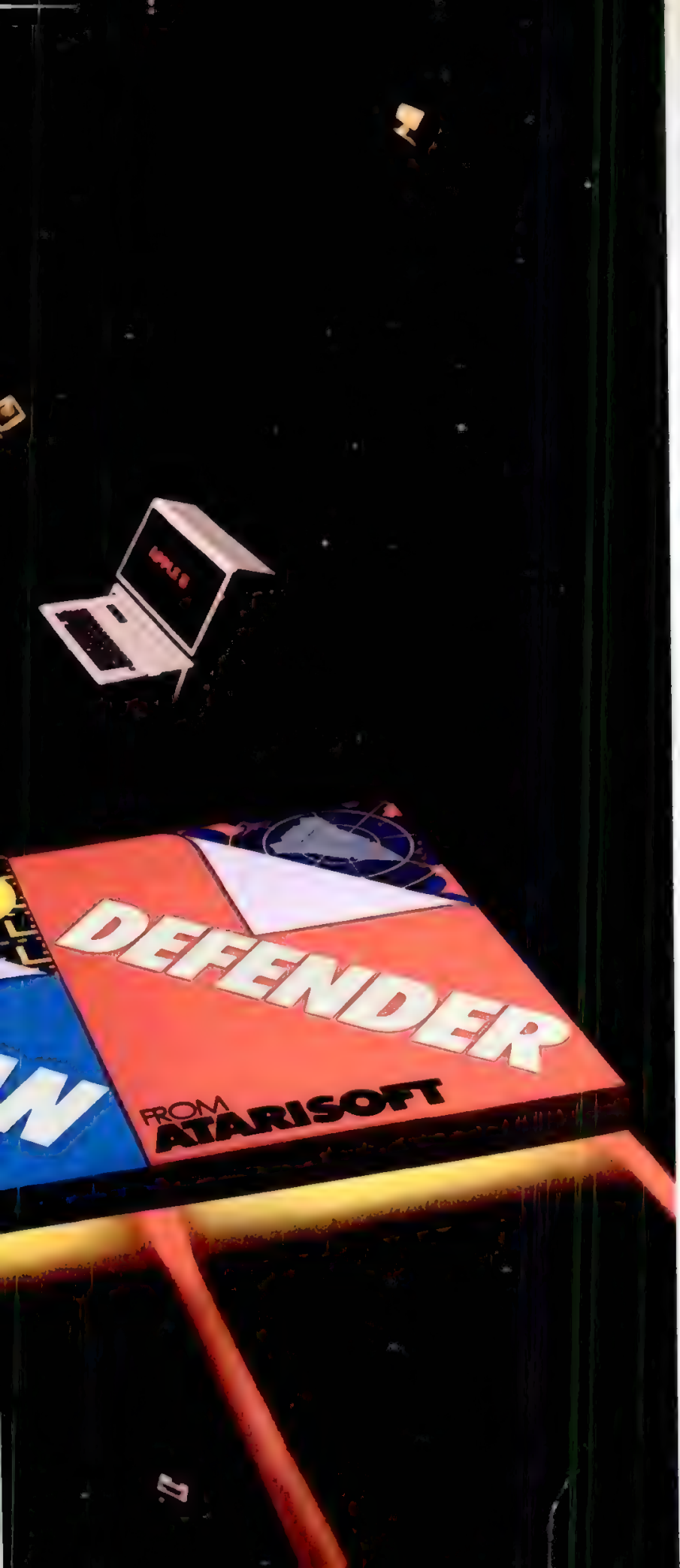
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LATE NEWS

Trends and developments of interest to users of IBM personal computers

PCH News

FROM THE EDITORS OF *PC* DECEMBER 1983

PC*jr* GOES ON DISPLAY BUT NOT UNDER TREE

IBM unwraps a home, education, and office computer all in one

BY CONNIE WINKLER

It's here. IBM has—finally—unveiled PC*jr*, a clever and compact personal computer aimed at the home and education markets with strong overtures to business.

The "new, affordable, personal computer" comes in two models: a $669 unit with 64K RAM, or the $1,269 unit with a disk drive and 128K.

PC*jr* runs a new BASIC version, and PC-DOS 2.10, and is available with a $175 thermal printer, a $199 built-in modem, and about 30 software programs, including four game cartridges, one of which is an apparently strong word processor, *HomeWord*. And the system



The Pcjr fully-equipped: keyboard, ROM slots, disk drive, and monitor.

can be upgraded to 640K main memory.

But, PC*jr* will not make it under the Christmas tree in 1983. During December it will be available only for demonstrations at IBM's 1,000 authorized dealers and IBM Product Centers. Units will be shipped in the first quarter of 1984 (perhaps in January).

But after Christmas, watch out. IBM could sell as many as 500,000 to 1,000,000 PC*jr*'s in 1984, according to Christopher Kirby, a consumer electronics analyst for the Sanford C. Bernstein Co. "Certainly at the outset, because of the compatibility with the PC, there's a tremendous opportunity for sales," said Kirby.

The November 1 announcement, dubbed a product demonstration by IBM, was long anticipated under the code name "Peanut" (among many others) by the industry, Wall Street, and PC users. Indeed, the first peek at IBM's latest baby was more like the mob scene of recent computer shows, rather than the usual austere, formal announcements of IBM products.

The fact the PC*jr* will not be out in time for Christmas doesn't bother IBM, but is certainly of interest to other home and personal computer dealers, particularly Apple.

"I can see it now." Special Christmas sales on Apple II's—the dealers will say, 'Why wait for PC*jr* and cheap software?' " comments Esther Dyson, president of Rosen Research, Inc. and editor of a prestigious newsletter, *RELease 1.0*.

One oberver points out that IBM has contracted with Teledyne, Inc. for the system's manufacture, and with software vendors, such as McGraw-Hill, for educational packages, and simply doesn't have all its supply lines up and running yet. IBM doesn't want to disappoint anyone once the product is formally available, the observer adds.

The PC*jr* announcement, although long-rumored for November 1, came at a particularly ironic time. Four days earlier Texas Instruments, facing growing financial losses, announced it was pulling out of the home computer market.

"All these people are shooting at each other, and IBM is standing by happily," comments Dyson.

The price and office-like capabilities of PC*jr* mean that it's targeted at the same business audience IBM has so successfully captured with its PC and XT.

Consumer electronics follower Kirby believes the PC*jr* is being aimed most squarely at Apple's IIe and Coleco's $600-to-$650 new computer-cum-printer, Adam.

"The question for Coleco is whether home users will pay the additional $300—the difference between the Adam price and the simplest PC*jr*," Kirby said.

Now the user with a PC in the office, can have PC*jr* at home for accessing on-line databases or electronic message systems, writing letters and memos, and still run games and educational programs for his family. Or, PC*jr* may be a companion system—perhaps for a secretary or support worker in the office—to a professional who is already using a PC.

PC*jr* opens up totally new avenues for the PC user. "It will be like seeing a cohort, whom you're used to seeing in a business suit, in a pair of Bermuda shorts. It's a whole new aspect of the person," adds Dyson. □

SIZING UP PC*jr*: THE TECHNICAL DETAILS

Inside and out, Big Blue's newest combines the familiar with the new

BY BILL MACHRONE

From a technical viewpoint, the name PC*jr* is almost a contradiction. Inside, the technology of PC*jr* is conventional, much the same as that of the PC. This comes as no surprise, in view of the basic design decision to make PC*jr* as compatible as possible with the PC. The packaging, however, is innovative and fresh.

The single most outstanding feature is the wireless keyboard. The infrared transmitter, according to IBM, runs for approximately 3 months on four AA alkaline batteries. The well-designed software that controls the keyboard interface gives an audible warning whenever a character is improperly received from the keyboard. Such an error can occur if something partially obstructs the keyboard LEDs or if there's an uncommonly bright light shining on the sensor.

The keyboard uses full-travel keys to activate a membrane switch matrix—new technology for an IBM product. Because the keys are on standard 0.75 inch centers, it is possible to touch type, but the "Chiclet" shape of the keys does nothing to help one's fingers stay positioned. The over-center tactile feedback emits a soft click, rather than the raucous clacking of the PC keyboard. Despite the sightly smaller key travel compared to the PC, the effort involved in typing is noticeably higher than for the PC keyboard and is consequently more fatiguing.

A great deal of bulk and weight has been saved by putting the power supply transformer outboard on the plug. A thin wire provides 18 volts AC to the PC*jr* system unit, where it is converted to the appropriate DC voltages.

The box is literally encrusted with connectors, openings, and receptacles, despite a deceptively simple-looking case. Viewed from the front, the infrared receiver lens is low and to the left of the single half-height disk drive. Despite all rumors to the contrary, the drive is 5¼ inches. Directly below the drive are two slots for ROM cartridges. The cartridges—each with a capacity of up to 64K—are one of the hallmarks of the PC*jr*. During the power-on process, the computer examines each cartridge slot to determine whether the program within should be autoloaded and executed.

At the back of the machine, there is an audio output port, meant to be amplified for full use of the three-voice sound chip. Next is the cassette port, which allows three modes of operation: program, data, and audio. The first two are conventional; the last allows PC*jr* to mix internally generated sounds with audio on a cassette tape, while controlling the cassette motor. Are you listening, trainers?

There is a built-in serial port, equivalent to the PC's COM2. There is no standard parallel printer port; that is handled through an expansion bus—but more on this later.

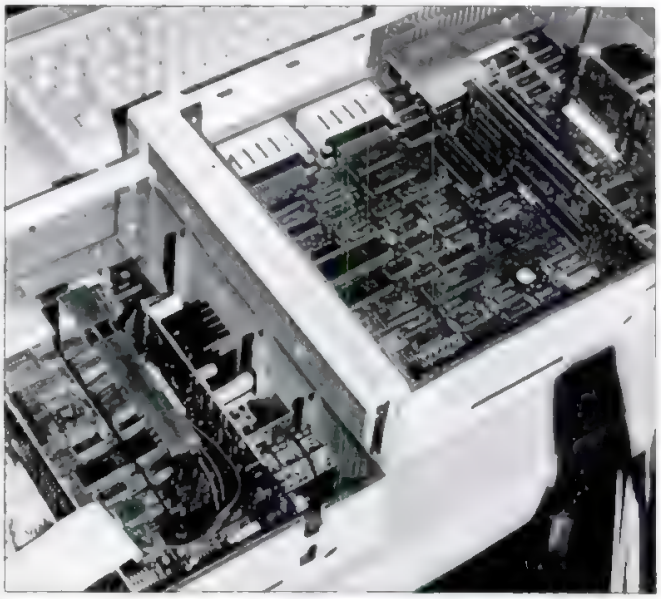
A direct-drive video port outputs direct RGB video for IBM-style color monitors. New sync signals make it compatible with more monitors than the PC. Composite video is also available at a standard RCA connector, while an RF modulator provides combined sound and picture signals for regular TV sets. There is also a light-pen input jack.

When the modem card is installed, a standard modular phone jack is accessible through the rear panel. The $199 modem, limited to 300 baud, can auto-answer and do tone or pulse dialing.

Another connector at the rear allows you to connect the keyboard with a piece of wire. This option is desirable in situations where there is more than one PC*jr* in the room or where there are other sources of potential interference. There are two inputs for joysticks. There is also sufficient game software available and forthcoming to ensure that they will see lots of use.

The only "mystery" connector on the rear panel is one marked simply "L." When asked what it was for, an IBM representative replied with equal simplicity, "Later."

The expansion connector—a double horizontal row of pins that brings out the system bus—is found at the right side of the machine. To use it, you place an expansion module of the same shape and size against the main box, and the bus connector daisychains through the module, thereby becoming available for other add-ons. Contrary to rumors, the machine could be expanded to the PC architectural limit of 640K through the expansion port, according to an IBM representative.



Inside, the PCPcjr features the 8088 processor and room for expansion.

The Inside View

Inside the box, there are three card sockets on the motherboard. One holds the modem, another the disk drive controller. The third is for what is known as the "64K Memory and Display Enhancement" RAM. It is necessary for 80-column and high-resolution color operation and brings the machine up to its unexpanded maximum of 128K. Notably absent is parity checking on the RAM. Considering the half-hearted implementation on the PC, it won't be missed.

PC*jr*'s overall performance will be a tick slower than that of the PC, primarily because RAM access is slower and the disk controller does more in software and less in hardware. Unless you are calculating ballistic tables or finding the largest prime number, though, you aren't likely to notice.

Firing up PC*jr* is interesting and exciting. It signs on with a 16-shade colorbar and does a power-up test. Since the ROM is 64K, there is ample room for a full diagnostic series in addition to the simple ROM test. Everything is done with icons, easy to understand and easier still to use. Synthesized music accompanies some phases of the test. An additional ROM bonus is *Keyboard Adventure*, a painless game that gets the raw beginner familiar with the functions and capabilities of the keyboard. You are aided by a colorful cartoon character, which scurries around an on-screen keyboard in response to the keys you press.

This brief description is perfunctory, given the level of software integration present in PC*jr*. The deceptive technical simplicity of the box is eclipsed by the array of well-integrated packages. *PC*'s first fortnightly issue in January will contain more details, including extensive hands-on sessions with PC*jr*. It will also feature articles on software development for PC*jr*. □

LATE NEWS

PC*jr* BASIC: A LOGICAL PROGRESSION

Improvements give new BASIC the edge.

BY PAUL SOMERSON

The big surprise about PC*jr*'s new BASIC is that there are no real surprises. Its Cassette BASIC is firmwired into a motherboard ROM and will do—and not do—the same things as its big brother's low-end BASIC. For another $75, IBM will give you the familiar khaki BASIC binder and a plug-in ROM cartridge with a modestly enhanced form of the PC's BASIC 2.0.

The few additions to BASIC are certainly welcome, but they won't stop the presses. Last year's BASIC 2.0 was an only slightly beefed-up superset of version 1.1 and didn't offer much that its predecessors lacked, other than a few graphics and sound tricks. PC*jr* carries on this tradition, limiting its new BASIC features to a handful of screen-display and music enhancements.

Of course, the scarcity of new features is a feather in Microsoft's cap. You really don't know how good Microsoft BASIC is until you try some teratogenic form like Atari BASIC.

Visual Treats

Ever since its introduction, critics have lambasted the PC's meagre palette of colors. Many computers on the market can run rings around its three-color, 320-by-200 pixel display. One reason Texas Instruments' Professional Computer hasn't gone the way of other me-too boxes is that its jazzy 16-color demos do turn heads. It's not difficult to juggle even 16 colors on one screen; all you need is a little more memory and a few additional commands. When IBM brought out the PC, it wasn't sure whether color was going to catch on; few suspected users would be casually be popping in supplemental memory in quarter-megabyte chunks. You once could buy a PC with as little as 16K of RAM. And the first foreign product IBM sold for its new PC was an Amdek RGB monitor.

Now, however, IBM hawks its own industry-standard color monitor, and competitors are selling memory add-ons to bring RAM up to 640K and more. Everyone loves color, except, perhaps, old-line word processors who prefer fully formed on-screen characters and descenders that don't hit the line below. Business professionals are fascinated by complex graphics and like to impress each other with how state-of-the-art their marketing presentations are.

But the real market for color is in the home and the classroom. Let's face it, the typical home user may dabble in spreadsheets to keep taxes straight or bang out a letter or two on a low-end word processor, but will probably spend most of the time playing games and noodling with BASIC. And there's no better way to rivet the kids to the screen than to dazzle them with a phantasmagoric color display.

This, of course, is PC*jr*'s territory. The color and sound enhancements will no doubt migrate to the PC itself, but they're sorely needed for anything going into the school and the home. IBM was wise to introduce them now.

Comparing Screen Modes

The new PC*jr* BASIC has *seven* screen modes, compared to the PC's three. Mode 0 is the same in both—text either 40 or 80 columns wide. However, since displays are handled differently in each machine, the less sophisticated PC*jr* requires 128K for an 80-character image. Since many PC*jr*s are going to be hooked up to home TVs, 40 does nicely.

Graphics modes 1 and 4 are roughly the same 320-by-200, four-color display as the PC's medium resolution, but there are subtle differences: Mode 1 seems to be compatible with existing PC graphics palettes where you're locked into colors 1, 3, and 5 or 2, 4, and 6, while mode 4 lets you pick which three of the 16 total colors you want to work with. Mode 2 is the familiar 640-by-200, two-color high-resolution color mode that few PC owners ever see.

Mode 3 is a *low*-resolution, 160-by-200, 16-color screen that technical whizzes have been able to simulate by programming the 6845 screen controller chip directly. Its main advantages are that users can more adroitly move larger pixel blocks on the screen and with less memory overhead than in other 16-color modes. Mode 5 is the same 320-by-200 medium resolution as modes 1 and 4 but with *16* colors.

IBM put this to good use already with several eye-popping dealer demonstrations of a house in a lightning storm. Mode 6 tops it all off with a high resolution, 640-by-200, four-color screen. The top four modes all require cartridge BASIC.

If you have enough spare RAM, the PC*jr*'s BASIC 2.10 allows you to write graphics screens to memory and then flash them onto the screen in quick succession, producing very impressive animations. You can do this already on the PC, but with text screens only (unless you write your own assembler routine to move memory). Screen mode 0 uses 2K of memory in 40 width and 4K in 80 width for each screen; modes 1 through 4 burn up 16K per screen; while modes 5 and 6 require 32K of RAM. IBM refers to these

screens as "pages" and provides a fast utility for copying up to seven screens from one location in memory to another.

The SCREEN statement also provides a "burst" parameter that enables or disables color. On an RGB, color is always enabled (turned on). On a composite monitor it can be turned on and off. In modes 1 through 4, you can create a gray scale on your screen by turning the burst off. In modes 2, 3, 5, and 6, it has no effect. SCREEN also allows you to define how much or how little existing screen memory you want it to erase.

There are a few nice associated touches. PALETTE and PALETTE USING allow you to redefine screen attributes. You can have a 16-color image on your screen and with one simple PALETTE statement turn just the red areas green. Very useful for highlighting and for most educational, entertainment, and business applications. You can also define a customized 16-color palette and read all the colors into the memory in one gulp with PALETTE USING. By clever use of visible and invisible colors, designers can do a very rapid form of animation known as "table animation."

Sound Effects

The PC*jr* also produces far better sound than the PC, largely because it contains a Texas Instruments chip that will play three voices at once. You can do this with the PC by writing clever assembler code or by having the PC play two brief notes one right after the other—but it doesn't work very well.

PC*jr*, on the other hand, becomes a nifty synthesizer that can play complex chords and produce a wide range of sound effects. The only problem is that its PLAY statement, like its DRAW, is an abstruse language of its own, with a raft of subcommands that could hardly be called friendly. Few casual users are going to master the BASIC arcana needed to do it directly.

The PC lets you play a note as low as 37 cycles per second; with PC*jr* BASIC, any values between 37 and 110 cps produce sounds that come out of the speaker at 110. Note duration can vary from .0015 to 65,535 clock ticks (there are still 18.2 ticks per second). The volume ranges from 0 to 15 and the default value is 15; for anything to emerge from the speaker you have, first tell it SOUND ON.

The number of voices can be set from 0 to 2, and the default here is 0 (which in IBM-ese means 1 voice). NOISE also lets you use a frequency source other than clock ticks, which may produce a variety of bizarre effects.

About the only other significant BASIC twist is that users can now gain access to IBM's own ASCII terminal emulation package through BASIC's TERM. While this is of use to some BASIC programmers, it is really a communications feature, a pure add-on to BASIC.

Old wine in new bottles? Hardly. These graphics and sound improvements on PC*jr* are definitely important and will be popular the day they're available. The last round of enhancements, which appeared in BASIC 2.0 and included such exotica as line styling and viewports, has not caught on in a big way. The PC*jr* may help popularize these, since it includes all those features, while many PC owners use BASIC 1.1, which doesn't.

The PC*jr* is a lot of computer in a tidy package, and right now its BASIC is a bit better than the PC's. Still, it's a safe bet that the PC will have all these new color and sound features and perhaps more to distinguish it from its new sibling. □

NORTON TESTS FOR COMPATIBILITY

First independent software test reveals near 100-percent compatibility

What was probably the first independent test of non-IBM-sponsored software on the PC*jr* took place during the first few minutes of IBM's demonstration of its new product on November 1 at IBM's New York City headquarters. *PC*'s contributing editor, Peter Norton, who is also the software author of *The Norton Utilities*, quickly and surreptitiously tested his programs on the PC*jr*, and, as expected, they ran perfectly.

"Almost any PC software that falls within the PC*jr*'s 128K and one disk drive limit should work just fine. I proved it with my own programs, and I'm sure we'll all find that nearly all of our favorite software will run smoothly on the PC*jr*," Norton said.

Worries? Yes. Even though he believed that his programs would work well on the PC*jr*, Norton confessed to considerable anxiety about possible problems. Now he and other PC software developers can take it easy and join us in a loud cheer. The good news is that the PC*jr* is as close to 100 percent PC-compatible.

Betting correctly that IBM's new offering—which we all used to call the "Peanut"—would have one disk drive and use lots of color made it possible for Norton to improve his programs so that they would perform particularly well on the PC*jr*. He was, of course, only adding a little "*jr* polish" to programs that would have worked well on the new machine even without additional grooming. This is what we can expect to see from the entire IBM PC software industry. The programs are already terrific on the PC*jr* and, with a little PC*jr* polish, they will run like a charm. □

LATE NEWS

CLEAR DECKS FOR "PC SENIOR"

IBM announces the XT/370 and the 3270 PC

BY BILL MACHRONE AND CONNIE WINKLER

Having captured most of the "personal" personal computer users, IBM is now going for the rest: the corporate users champing to get at the vats of data stored in the company's mainframe machines, the professional users who want to play on their PCs, and the scientific and engineering users who have historically used mainframe time or dedicated minicomputers for number crunching.

Many, awaiting IBM's PC*jr* (formerly Peanut) announcement, were caught off guard in mid-October with the "PC Senior" announcement of the XT/370 and the 3270 PC.

The XT/370 and the 3270 PC are IBM's answers to the corporate user who doesn't understand why his PC can't access the company's big computers. Many small vendors have been scurrying to bridge this gap with ambitious micro-to-mainframe connection packages and schemes. IBM has brought it all down to one-stop shopping for its mainframe-based network needs.

Mainframe Alive and Well

IBM has served notice that the mainframe is not dead. In fact, it is alive and well and living on your desktop. Its new trappings are those of the PC XT. What the company has come up with is a three-board set that implements the 370 series instruction set and provides a single-user VM/CMS environment.

Dual 68000 Chips

The PC XT/370 provides up to 4 megabytes of virtual memory using half a megabyte of real memory. It can communicate directly with host 370 systems and is object-code-compatible. Most applications that can run in a single-user VM environment will run on the PC. Similarly, object code generated on the PC can be uploaded to any machine in the 4300-370-308X range. The machine actually executes 370 programs, thanks to its dual 68000 microprocessors and 8087 math chip. The chips incorporate IBM-designed modifications, implemented by Motorola and Intel, respectively. A customized 68000 is mask-programmed to directly execute over 70 of the 370's instructions, and another 68000 emulates 45 others. The 8087, meanwhile, directly executes the 370 floating-point instruction set. The 68000s run at a relatively conservative 8 MHz, yielding a benchmark speed about half that of a bottom-of-the-line 4300 for commercial applications and roughly double that of the entry 4300 for scientific applications. The inherent speed of the 8087 is readily apparent in these latter tests.

All three processor chips reside on one card, using the compact flatpack version of the 68000, rather than the monstrous dual-inline package. The companion memory card is half a megabyte of convential 64K chips. The memory is dual ported in that it can be accessed directly by the processor board or by the 8088 on the system board. The 370 processor uses a ribbon cable bus, rather than the system bus, to directly connect the processor and memory cards. The system board comes fully populated with 256K RAM. When the 8088 accesses the additional memory, it "sees" only 384K, bringing it to the PC's limit of 640K.

The third board in the XT/370 set is a 3270 cluster communications controller, permitting the machine to appear as a 3277 display terminal to any 3274 display control unit. The ability to emulate a 3270 cluster terminal enables the user to communicate with a host system for traditional communications or to exchange files. To this end, VM/PC implements CMS minidisks and allows them to be freely exchanged between a host and the XT/370.

The trio of boards is available as an upgrade kit to a normal PC XT. Their design is such that no modifications are required to the XT or its control program ROMs. The 370 kit costs $4,500, while an XT with the board set installed costs $8,995. A third version with 20 megabytes of hard disk costs $11,690. In addition to straight purchase, the machine will be available for financing through IBM Credit Corporation. It will also be eligible for reduced-price purchase under IBM's Volume Purchase Agreement.

Apple Squarely Hit

While the 3270 PC doesn't have the integrated software capability of Apple's Lisa professional computer, Apple has been squarely hit—again. The 3270 PC (3270 is IBM's ubiquitous family of mainframe terminals) has a seven-window display screen and 122-key keyboard, combining both the PC and 3270 function keys. This jazzy PC is available with a high resolution eight-color display. The 3270 PC can tap up to four host computer sessions, run one PC DOS 2.0 application, such as a spreadsheet or word processor, and access two "electronic notepads," all at the same time. Connection to any of IBM's big mainframes is through the 3274 controller.

The 3270 PC, which ranges from $4,290 to $7,180, will clearly be the work station of choice for the mainframe computer jockey. The multiple concurrent sessions, coupled with local processing, provide heretofore unavailable flexibility within the context of IBM's systems. □

PC XT/370: WHAT DOES IT MEAN?

New personal hardware single user equivalent of mainframe

BY BILL MACHRONE



The upper card is the XT/370 processor; the lower is 512K RAM. The chips in the lower left corner of the processor are the two 68000s and the 8087.

People have speculated about a "370 on a chip" for years. It is here. What does it mean? What does it change? In a word, everything.

You might view a microcomputer that can execute 370 opcodes as a gee-whiz technical tour de force, but it is that and more. The key thing is that it is a VM/CMS work station. The programmer has an utterly dedicated tool that is a single-user equivalent of the mainframe.

Not an emulator. Not a subset. But the equivalent. The work station concept has proven itself, especially in the UNIX environment. There the programmer has a fully dedicated system resource, permitting turnaround time and flexibility unavailable in the mainframe's normal shared environment except during the graveyard shift when the machine is not busy. The burgeoning popularity of minicomputer-based work stations with high-productivity operating systems has been a thorn in IBM's side. While the CMS environment is also a programmer pleaser, the cost of the machine necessary to run it has been prohibitive to many smaller companies.

A Willing Lab Partner

Now the minicomputer vendors have been neatly outflanked by a low-cost personal computer with complete compatibility, not just communications capabilities, with the mainframe. The old "mini for the labs, mainframe for the business" concept just went out the window. The PC has already proven itself to be a capable and willing partner in the lab, especially with some of the add-on I/O boards. Now everyone can run a standard operating system, flipping back and forth between straight PC and mainframe applications.

A key difference between IBM's approach and the typical minicomputer work station is that most of the minicomputer systems multitask, allowing you to do work in the background and foreground simultaneously. The XT/370 does not multitask; it expects that you will release background jobs to the mainframe for execution. Thus, the 3270 controller card becomes a vital link in the overall concept. While it is conceivable that the XT/370 will be used in standalone work stations, it is far more likely to replace 327x terminals in existing bisync cable networks.

Think for a moment about the implications of a desktop 370. A desktop 370! There are more lines of code floating around for 360/370 machines than for any other. Granted, much of what's out there is payroll systems and accounts receivable, but there are some gems, too, especially in compilers, statistical and scientific programs, and utilities. If they run under VM/CMS as a single task, they'll run on the XT/370.

At less than $9,000 for an entry-level product, it is within reach of the entrepreneurial free-lance programmer. He gets a 4-meg virtual machine and can write in the client's favorite compilers, such as COBOL and PL/I, and can deliver executable code to his customer. It will then run with nary a twiddle or tweak on the client's mainframe. We've just taken another giant step towards telecomputing.

Young Mainframe Jockey

Another scenario: A free-lance programmer/consultant has an XT/370 in the den and makes a nice livelihood with it. Her daugher sits down at the keyboard, cracks a few manuals, and picks up the rudiments of CMS. One thing leads to another and you've got a 10-year-old mainframe jockey. She can walk into any big time-sharing operation, sit down at a console, and feel right at home. I'm not saying that LOGO and the kid-speak operating systems don't have a place, but they do have their limitations. 370s don't. The primary mainframe limitations are in on-screen graphics and interactive applications. But there is always a PC lurking within this 370, ready to roll out its bag of tricks. Most importantly, the VM/CMS files and PC-DOS files can be easily translated in either direction.

The PC and mainframe worlds have been brought closer together. A parting image: IBM is a behemoth battleship. The minicomputer vendors, a fleet of small, maneuverable cutters. IBM has been firing with its stern guns, always behind the nimbler ships. The PC XT/370 is a tremendous volley from the forward guns, across the bows of the minicomputer fleet. □

LATE NEWS

The Soul Of A New Magazine

Dear Friends,

Whenever the computer universe expands, the computer-using public finds new and exciting opportunities, but must first find the answers to many new questions. IBM has presented the public with a new machine—the PC*jr*—and with it, a fresh opportunity to bring computing into people's homes, schools, and offices. We believe the arrival of the PC's little brother is as significant and lasting a development in the history of computing as the IBM's initial foray into microcomputing has proven to be. We think the PC*jr* is an exciting machine that will set a new standard of simplicity and flexibility.

When the IBM PC was announced a little more than 2 years ago, a group of journalists swiftly created *PC Magazine* to help people make the most of the remarkable new opportunities, to ease their confusion and uncertainty in working with the new machine, and to inform them of new products that could be used with the IBM Personal Computer.

The PC*jr* will present new possibilities for today's PC users, and will bring many more people into the family of IBM computing. We are addressing this new development in the best way we can—by creating a new magazine. *PCjr Magazine* will introduce its readers to the potential of this new computer, and help clarify the distinctions and links between it and the IBM PC.

PCjr Magazine is part of the tradition established when *PC Magazine* was launched in San Francisco, that followed the magazine to its new home in New York City, and that inspired the many hardware-specific computer publications created by Ziff-Davis in the past year. *PCjr Magazine* is designed to help you get the most from your personal computer—and from yourself. We trust it will be an entertaining, precise, up-to-the-minute, and—most important—independent and fair publication, as these have been the traditional goals of *PC Magazine*.

In fact, to make sure the *PC* spirit takes root in the pages of our new cousin, we've sent an important part of *PC Magazine*—our stalwart executive editor, Corey Sandler—to be the editor of *PCjr Magazine*. Corey and many of your old friends (and new writers and editors you'll be meeting soon) will bring this new magazine to life—and continue to write for *PC Magazine* as frequently as possible.

All of us at *PC Magazine* wish Corey and the rest of the *PCjr Magazine* staff the greatest success. Corey has been an invaluable contributor to *PC Magazine*'s growth and maturing, its point of view and sense of humor. We are confident that *PCjr Magazine*'s readers will treasure and trust him as much as we do today.

With best wishes,

The Editors and Staff of *PC Magazine*.

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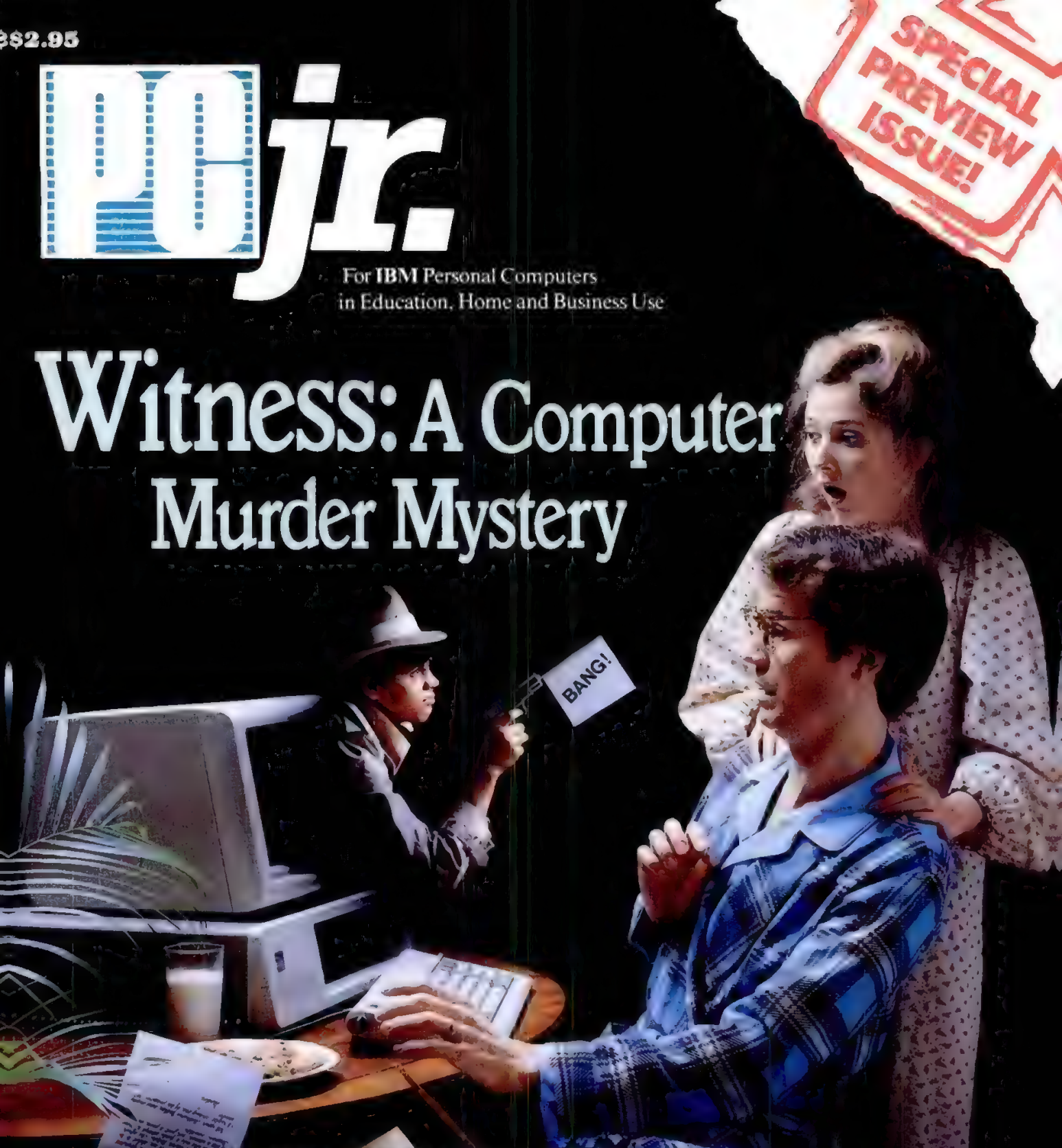
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For IBM Personal Computers
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SPECIAL PREVIEW ISSUE!

Witness: A Computer Murder Mystery



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TRACKING YOUR INVESTMENTS AT HOME
SOFTWARE STUDY FOR THE SAT

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COREY SANDLER

It's A Good Thing We Don't Have To Leave The House

I woke up before the alarm went off and slipped groggily into the shower. It was going to be a busy day, and I reviewed the agenda as I shampooed my hair: I needed to finish writing my column (this one) and get it to the art director for design and typesetting; I had to make airplane reservations for a trip out West to a computer convention; I wanted to shop for a new color television for the kitchen; and I needed to sit down and do a bit of research on tax-free municipal bonds because my accountant didn't think it was all that bright to put book royalty checks into a jar on the coffee table.

And before much else, I needed to know how the Rangers did last night at the Garden. I knew, too, that my wife Janice wanted to continue her training with a word processor. And we both must find the time to progress past "*Bonjour, nous sommes américains*" in that French language refresher course if we're to be any good at all when we stroll down the Champs Elysées next spring.

It's a good thing we don't have to leave the house.

All of our work, much of our shopping and banking, our education and a good deal of our leisure-time fun and games now revolve around the tabletop home computer.

And that revolutionary change in the nature of the activities of home is part of what *PCjr Magazine* will be about. This is a magazine devoted to the exciting new IBM PCjr home computer in its educational, home and business uses.

We welcome the arrival of the IBM PC's little offspring. Like all proud relatives, we are flushed with excitement at the thought of all of the possibilities as Junior grows to maturity. At birth, this new machine is only slightly less capable than its parent and, in fact, is possessed of greater abilities in sound and graphics than those of its parent. You'll read about all of the official and nonofficial enhancements to Junior's skills in the pages of our new magazine.

What do we know already? IBM has presented us with a machine that is a junior in size but a megabrain in capacity. We already know of outside manufacturers gearing up to produce additional memory modules beyond IBM's 128K top end; we've heard tell of

PCjr

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expansion chassis that will plug into the PCjr and allow use of the full range of big brother PC's multi-function boards, and we're expecting some exciting new software products that will take this new computer into worlds unimagined months ago.

IBM has called its new machine a "personal computer" and has included in its initial distribution of software some very sophisticated word processing and spreadsheet programs. Clearly this junior is no mental midget.

Back in the dark ages of computing, perhaps 10 years ago, a computer was a device only the sacred priests of technology ever laid hands upon. The computer was a room-sized collection of blinking lights and whirring tape drives kept cloistered in an air-conditioned sealed room. Now the same power—more, actually—can be had in a sewing-machine-sized box with a handle. It can be placed on the kitchen table and plugged in before the dishes have been cleared.

But why start yet another magazine? In 1981, approximately 2 percent of American office workers used a personal computer, with a total of only about one million machines on the market. In 1982, when IBM introduced its PC (and some say legitimized the market) the number had grown to about 4 percent of American workers and perhaps two million machines in use. This year, 1983, the numbers have nearly doubled once again, to 7 percent of workers and 3.8 million PCs. And according to Future Computing, a professional crystal ball-gazer in the microcomputer field, the num-

PCjr: How to Write for Us

Editor, PCjr
Room 729
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New York, N.Y. 10016

Include a brief outline of the story you propose to write, some indication of the angle you will pursue and give us some sense of your writing style. Please be sure to include your home and work telephone numbers in any letter you send us.

We'll try and call you within three weeks to discuss any article we would consider for publication. *PCjr* pays on acceptance, on the basis of negotiated fees. We pay extra bonuses for sidebars, usable art, and for copy provided on IBM PC-formatted floppy disks with WordStar files. If you send copy to us in that manner, be sure to protect the disk against damage in transit, *and* include a printout.

If you will require software or hardware to perform a review, please check with the editors before contacting any companies directly.

All copy must be double-spaced. Please use white paper and a fresh ribbon. Leave extra white space in margins and at top and bottom of all copy. Use a paragraph indent of five spaces. Put your name, title of story and page number on every page of your copy.□

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bers will double again in 2 years or so—to 16 percent of workers and nine million PCs in 1985.

But if we look only at the business world and overlook America's homes and schools, we are missing the forest for the trees. Consider these numbers: Today perhaps 9 percent of American households have a personal computer of some sort. That's approximately eight million home computers, a lot of thinly disguised toys among them. But just 2 years from now, the number will nearly *triple*, to 24 percent of U.S. households and 23 million machines. And the new PCjr home computer of today is a serious, capable tool.

What can you expect to learn in the pages of *PCjr Magazine*? Here are a few samples from our story list:

Is a personal computer just another appliance, like a toaster or a television set, or does it require some special considerations for its protection and yours? Can you tie your computer into a web of control and home security devices?

How can you maintain your personal financial portfolio on a home computer? How do you go about cataloging your wine, stamp or coin collection?

What can you learn from a computer? We'll ask educators about the value of programs for children; we'll ask psychologists about the lessons learned from video games. We'll teach you a bit about programming in each issue, too.

And speaking of games, each month we'll present reviews and articles detailing the new generation of intelligent arcade and simulation entertainments.

What services will be available to you from your home? We'll show you how to do research from specialized databases. We'll take you inside CompuServe, The Source, Dow Jones, Dialog, BRS and other public networks. We'll show you how to consult a travel agency, buy a stereo system or figure out your finances. We'll consult tax experts for suggestions on writing off business uses of your computer equipment at home.

You'll learn how to make decisions on configuring a computer for your special needs at home. You'll find out the differences between a machine for the home and a machine for the office. We'll explore how to maintain compatibility with a computer at work. We'll have stories on simple and low-cost printers, monitors, plotters, joysticks, digitizers, modems and more.

And you'll find columnists each month discussing games, education, operating systems and new products. We'll also feature a monthly question and answer column, and hints for and from our readers.

And we're going to do our best to present all of this information in a lively, entertaining and informative way. We're going to place a special premium on the quality of writing and graphics in our magazine to serve all of the family. We want to keep that sense of "gee whiz" that most of us felt when we sat down at the keyboard for the first time.

Will you join us in bringing up Junior? □

Coming Up in PCjr

Your Home Computer Tutor: Can a software package earn your college-bound child a super SAT score?

Inside the Public Networks: CompuServe, The Source, BRS, Dow Jones and other dial-up services. The world is just a phone call away from your personal computer.

Casino Software: Can they show you the way to riches, or are they just another game?

Your Personal Home Planner: Using your IBM as architect, landscaper and interior designer.

The Tax Man Cometh: Toting up your 1040 on your home computer.

Is There a Doctor in the Computer?: Charting your health on your IBM.

In Cold Type: Low-cost matrix printers for the home.

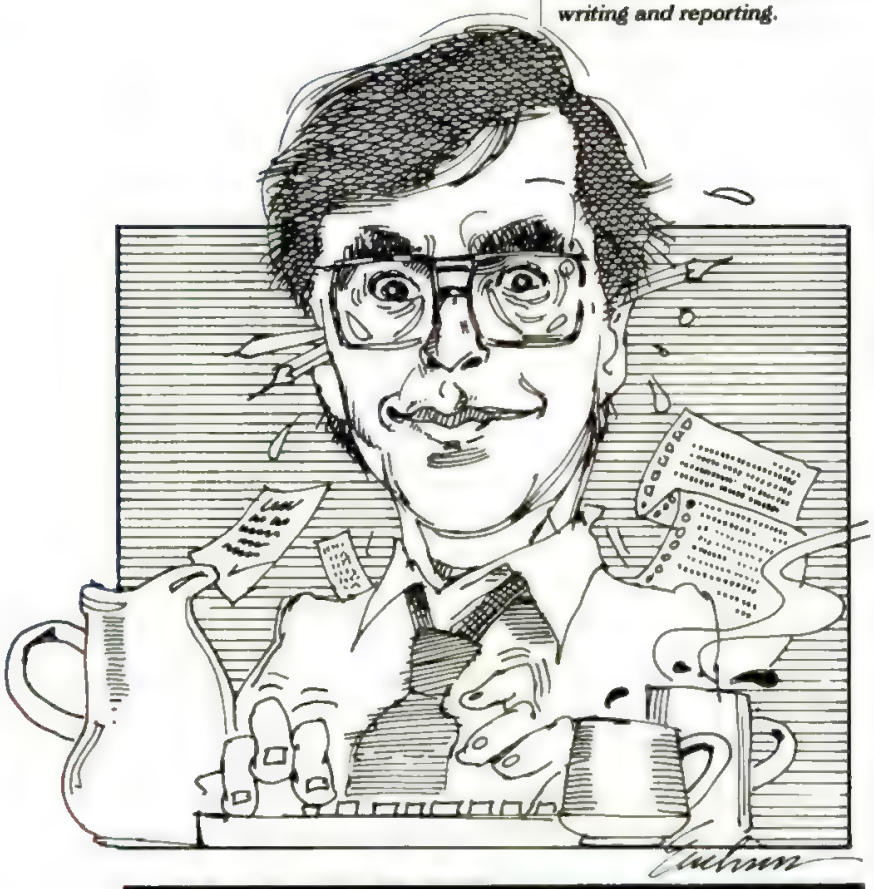
Creating a Dungeon In Your Home: *Enchanter* casts a word spell over those who discover it.

What's Cooking?: A dash of salt, a pinch of spice, and a bit of RAM are all you need to create great dishes.

Monthly Columns: Learning to program in BASIC; Computer play and games; Education; Opinion by Lindsy Van Gelder and Stephen Manes, and the PC Home Companion, an advice and comment column answering our readers' letters.

Among The Writers and Columnists You'll Find in PCjr Each Month

COREY SANDLER, *Editor of* PCjr, *lives to write and writes to live. He has produced five books in the last 18 months, including a book on business graphics for the IBM PC, a children's BASIC primer, a book on speechwriting, and two novels. As executive editor of* PC Magazine, *he wrote the monthly column "From the Editor's Screen" and several features each month on topics ranging from electronic mail to preschool education. A former Associated Press newsman and newspaper editor and reporter, he has won numerous awards for his writing and reporting.*



COREY SANDLER

ILLUSTRATION: MARC ERICKSEN

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The Writers and Columnists in PCjr



PAUL SOMERSON *is a self-confessed "computer junkie." He has written numerous cover stories for* PC Magazine, *where he serves as a staff writer. When he leaves his PC at home it is to go to his PC at work, or is it the other way around? At one or the other machine, he has written articles of his exploits as a computer salesman for a day, as a free man set loose in a computer toy shop, and he has chronicled the demons, devils and dybbuks that can await the unsuspecting personal computer owner. Somerson will write the monthly "Reader to Reader" column, sharing and explaining the secrets of microcomputing revealed to and by users.*



LINDSY VAN GELDER

LINDSY VAN GELDER *and her two children are becoming known nationally as a home computing family. A prize-winning writer featured in several* Who's Who *volumes, she is contributing editor to* Ms Magazine *and* PC Magazine. *She has been a syndicated columnist for UPI, and reporter for daily newspapers including the* New York Daily News *and the* New York Post. *Her work has recently been featured in such publications as* Rolling Stone, New York *magazine and* Town and Country.

MARTIN PORTER *is the video and home electronics columnist for* Gentleman's Quarterly *and the audio and electronics columnist for* The Rolling Stone Record. *He has written for the* Village Voice *and* Rolling Stone *and is the pop music reviewer for the* New York Post. *He is a contributing editor of* PC Magazine. *He will write a monthly column on educational uses of home computers.*



PAUL SOMERSON



MARTIN PORTER

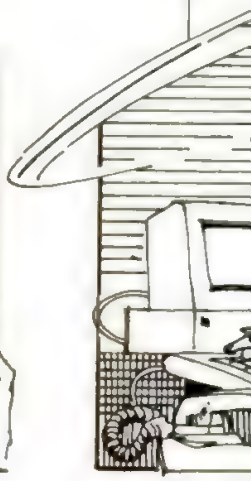
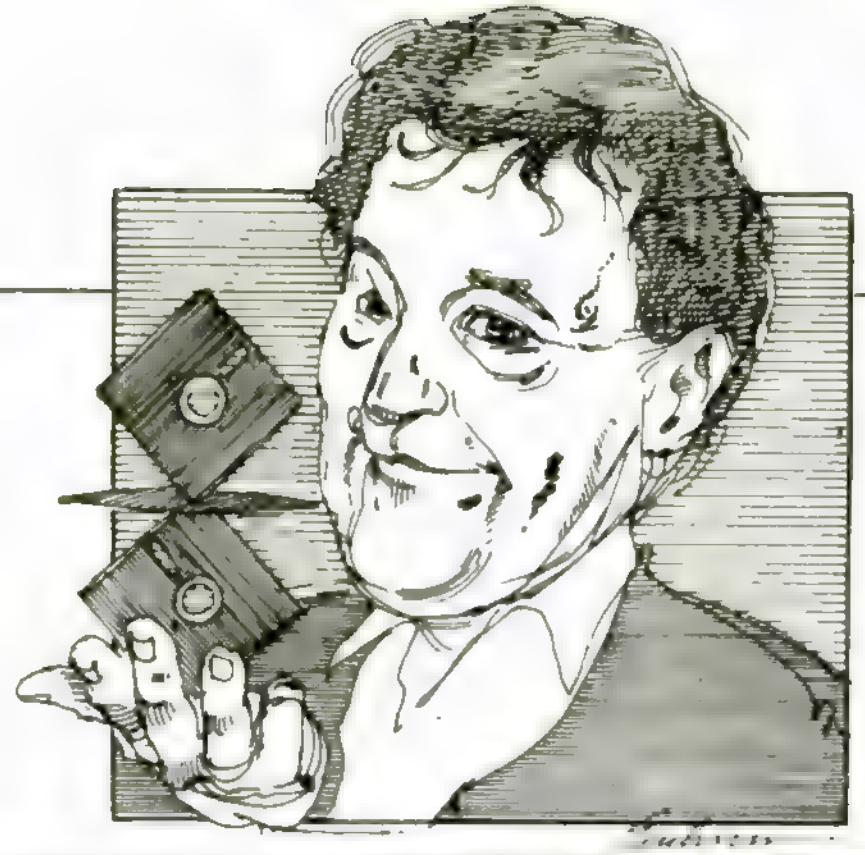


ILLUSTRATION: MARC ERICKSEN



JOHN WORAM

ERIC FREEDMAN *is a reporter for the Albany, N.Y.,* Knickerbocker News. *He has won the New York State Bar Association Media Award five times in the last six years, and his work has been published in* The National Law Journal, Mother Earth News, Farmstead, *and the* New York Law Journal. *In November he was the Journalist-in-Residence at Colorado State University.*

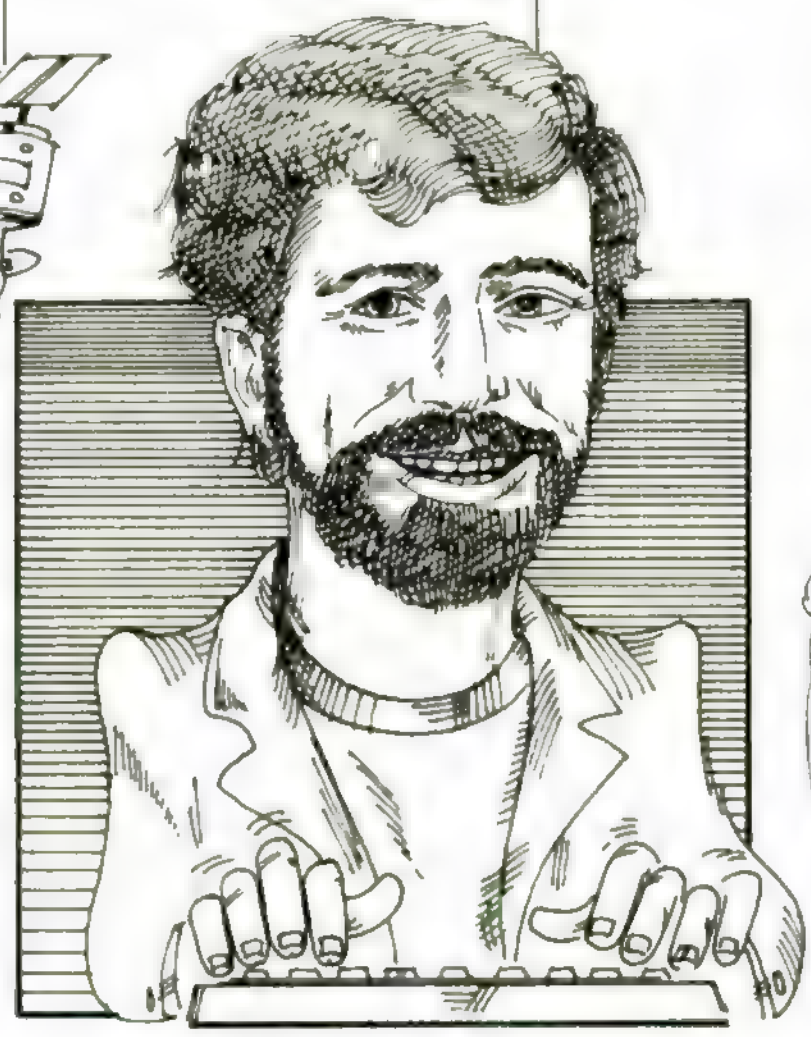
JOHN WORAM *says he became interested in personal computers because, "I had to get on board or get left behind." His primary career has been in sound engineering, and in that field he is one of the leading experts. He is director of the Music Engineering program at the University of Miami and editor of* dB Magazine *and* Modern Recording and Music, *and a contributor to the McGraw-Hill* Encyclopedia of Science and Technology *and the author and editor of several books. Woram will be writing a monthly column with tutorials in BASIC in order to help our readers get the most out of their personal computers.*

STEPHEN MANES *is a prolific author, having written more than twenty books, many of which have been translated into foreign languages. His credits include writing for movies and television. He is an active member of the Authors Guild and the Writers Guild. Manes will write a monthly column of opinion and fact, which he wants us to call "Personal Curmudgeon."*

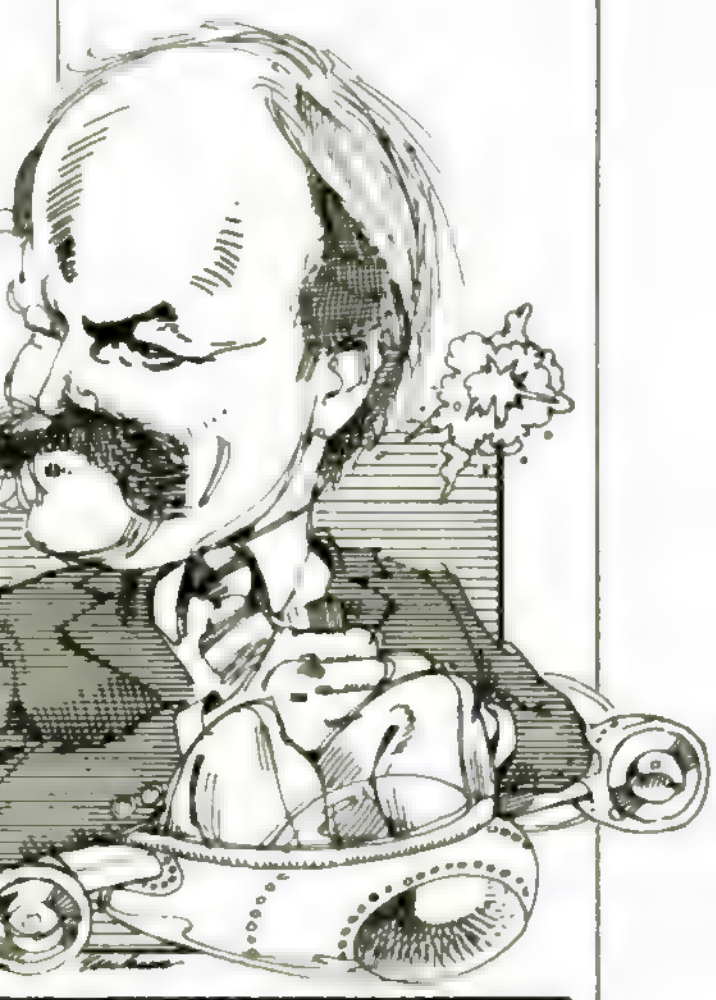
DON KENNEDY *has been a contributing editor to* Gaming Business Magazine *and the associate editor of* The New Jersey Standardbred. *His work has appeared in* The New Jersey Monthly, Gambling Times, Hoof Beats, *and* State Legislature *magazines. He has taught writing at the State University of New York at Binghamton and is currently working on his second novel.*



ERIC FREEDMAN



STEPHEN MANES



DON KENNEDY

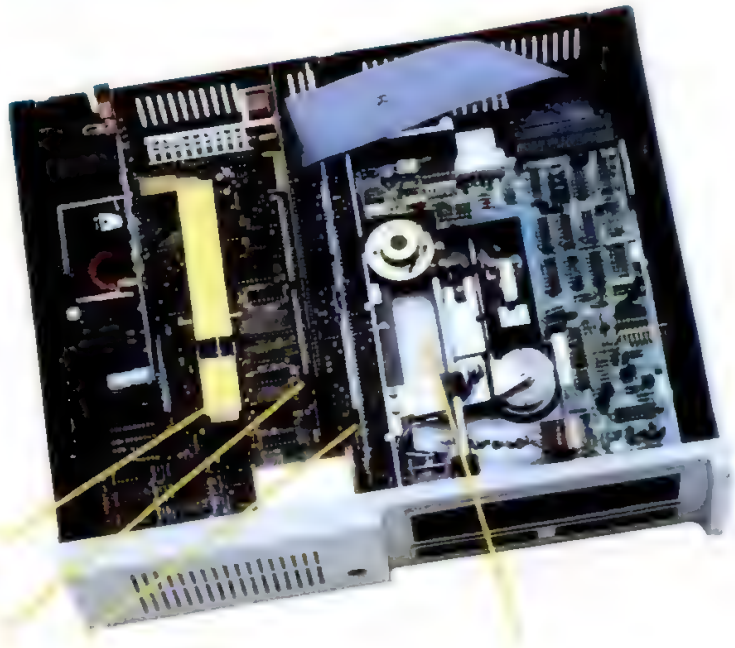


Power supply, including exposed toroid transformer

Slot for IBM memory and display expansion board

PC jr: Chips Off the Old Block

WHAT'S UNDER THE covers of the PCjr? A smaller—but little changed—version of the PC mother board. The PCjr uses the same set of chips, including the Intel 8088 microprocessor brain, the 8253 clock, the 6845 Motorola display chip, and other electronic devices. There are a few differences, pointed out in our inside peek on the next page. —*Corey Sandler*

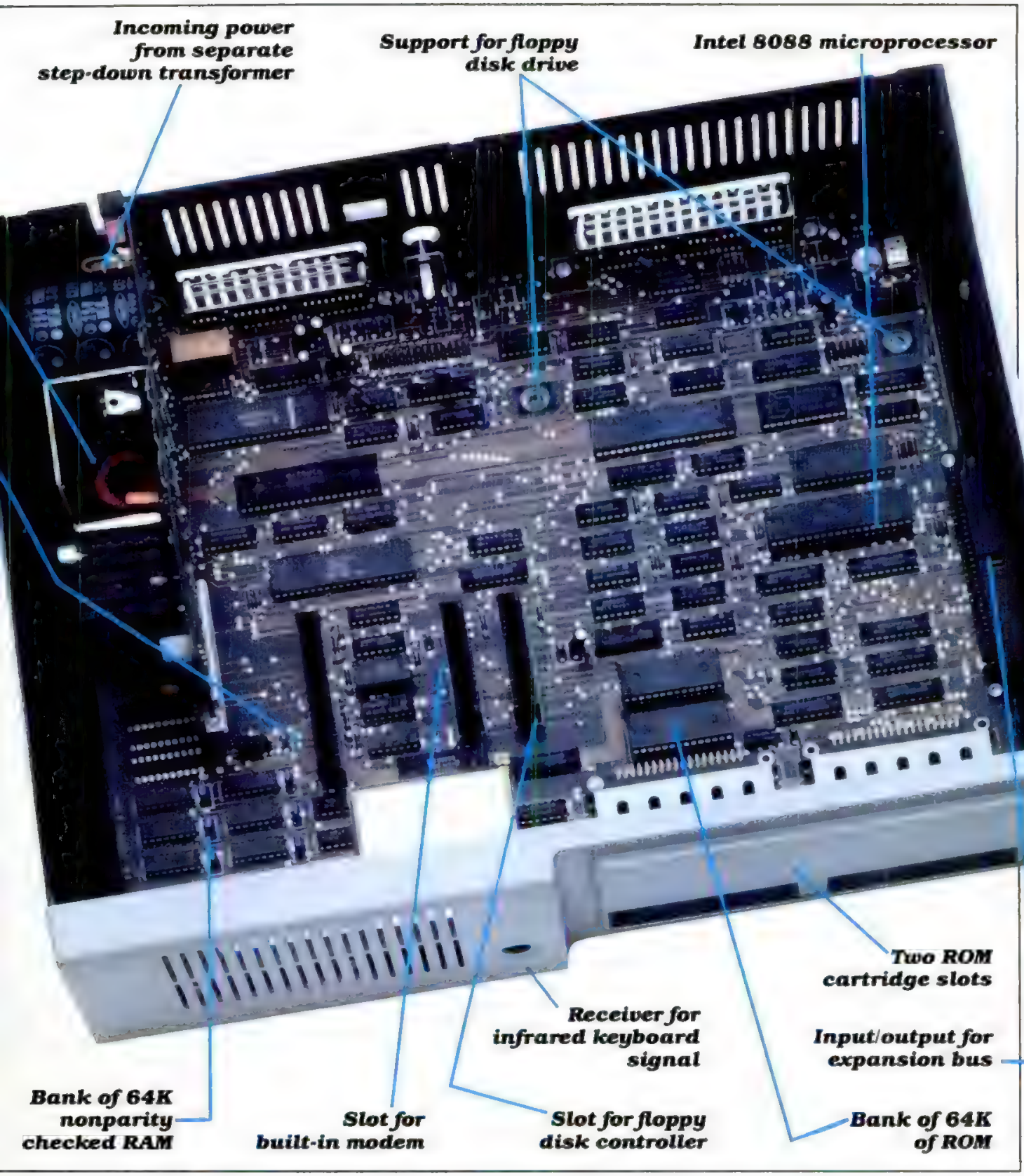


IBM memory and display expansion board

Built-in modem board

Floppy disk controller board

Half-height, double-sided disk drive


Incoming power from separate step-down transformer
Support for floppy disk drive
Intel 8088 microprocessor
Two ROM cartridge slots
Receiver for infrared keyboard signal
Input/output for expansion bus
Bank of 64K nonparity checked RAM
Slot for built-in modem
Slot for floppy disk controller
Bank of 64K of ROM

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THE COMPUSERVE INFORMATION SERVICE is a kind of Wonderland of electronic communications, entered through a home computer, modem, and telephone wire instead of through a rabbit hole. Once inside the system, perhaps Alice wouldn't feel out of place after all. CompuServe offers its own tea party, although it's more like an all-you-can-eat smorgasbord than a simple fare of tea and buttered bread. Games, banking by mail, professional publications, international news, horoscopes, and movie reviews are all on the menu, along with stock prices, tips on buying diamonds, weather **(Continued in an upcoming issue . . .)**

jr.
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ILLUSTRATION: DON WELLER

ERIC FREEDMAN

Through The Compuserve Looking Glass



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KAREN COOK



SPECIAL PREVIEW ISSUE!

A STAR IS BORN.

Making A Computer Training Tape

Lana Turner, THEY SAY, was discovered sitting at a drugstore soda fountain in Hollywood, sipping a strawberry malted. Gary Cooper was working as an extra; a director noticed his good looks and cast him in a role when a scheduled actor didn't show up. And Alfred Hitchcock made himself famous as a cameo player when he started crossing his own sets while the cameras were running.

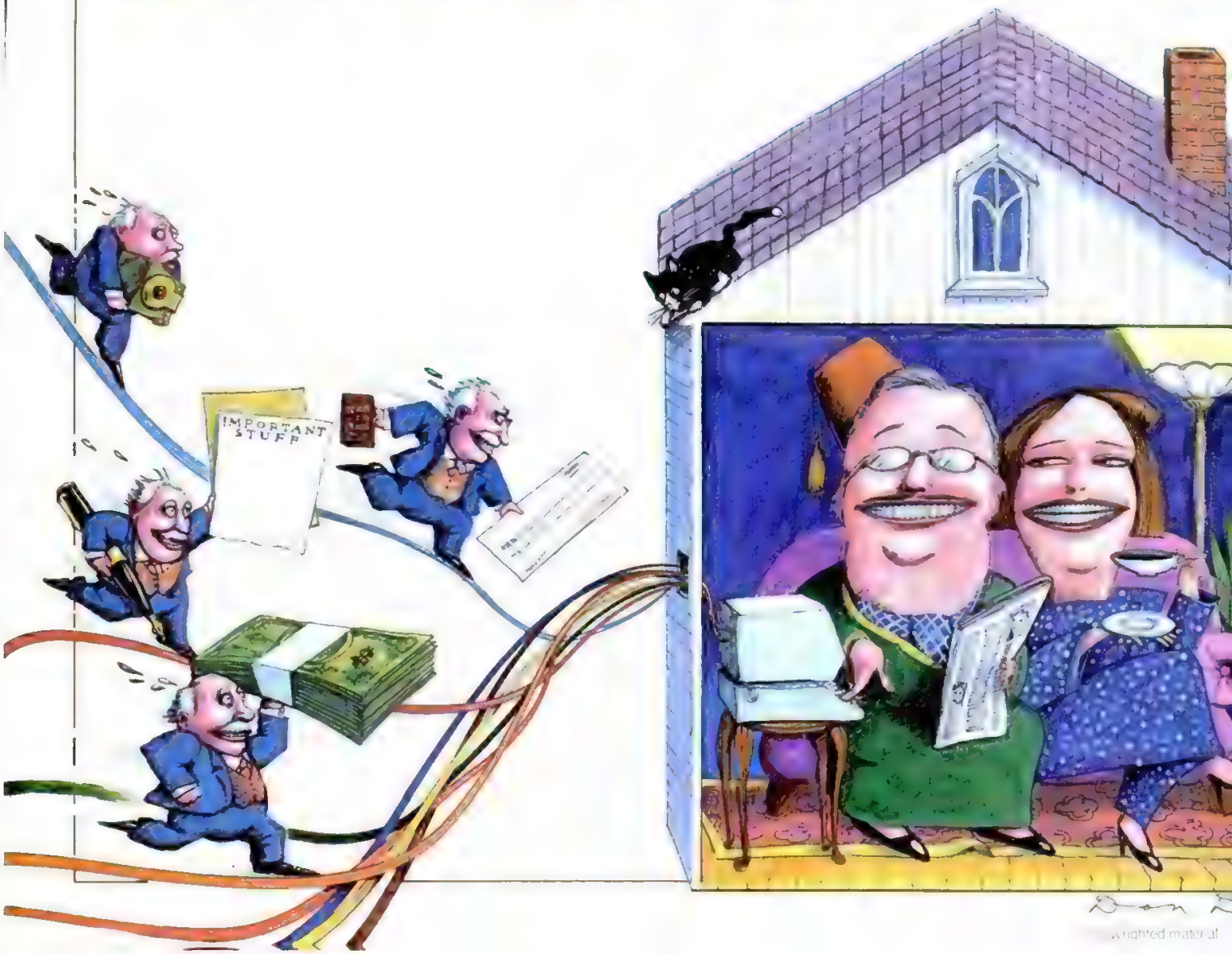
Jack Hersch may not be an actor, but he knows computers. He founded his training company, Micro Learning Concepts, Inc., wrote a script called "Introduction to *VisiCalc*" (later changed to "Learning Concept: The *VisiCalc* Program"), and hired a director named Don Horan.

Hersch and Horan began holding auditions for actors who could speak confidently about computers to uneasy middle-aged executives. More than a dozen actors in their thirties **(Continued in an upcoming issue . . . . .)**

ILLUSTRATION: JOEL NAPRSTEK

LISA HARBATKIN

Banking on Your Home Computer: Checks & Balances Without Tellers



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but they're sure to know your name. And you can be certain there will never be a waiting line when you make a deposit. All you need to do is open a branch office in your rec room.

Although you can't get cash from your home computer, you can take care of nearly every other banking need. With varying degrees of sophistication, current home banking systems allow you to pay bills, transfer funds between your accounts within the bank, and keep track of your financial records. Depending on the bank, other services may be available, too. Citibank, for example, allows you to order traveler's checks through HomeBase, its software program, and also provides, for an additional fee, access to the Dow Jones News/Retrieval service.

As attractive as home electronic banking may seem, potential users shouldn't sign on without seriously considering the issue of security. In addition to the multilevel access procedures, current systems provide further security by refusing to accept random attempts at access. If any code is entered incorrectly three times in sequence, the system cuts off. To get into it then, you'd have to phone the bank and convince it you're a legitimate user.

Voiceprint identification would provide even greater security. You don't need much imagination to think

(Continued in an upcoming issue . .)

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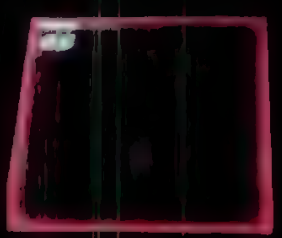
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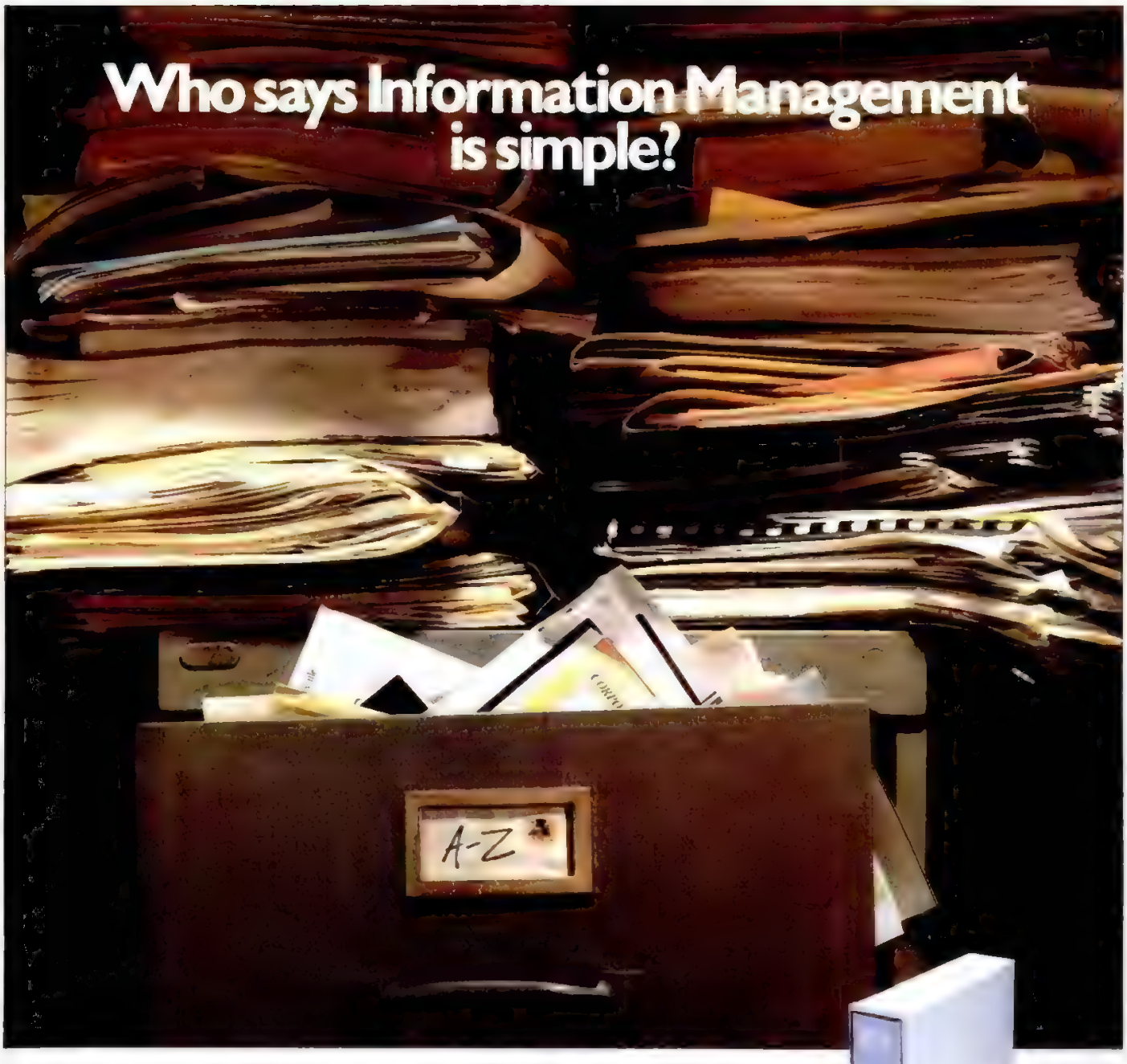


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The system combines data base features with word processing and graphics. This combination of functions makes the Information Management System an ideal solution to any problem requiring large storage capacity, rapid entry, simple editing, recall analysis, comparative graphics, or reporting flexibility.

Built-in features allow you to store large amounts of information, search and compare information according to any criteria you desire, and edit information at any time without rebuilding files.

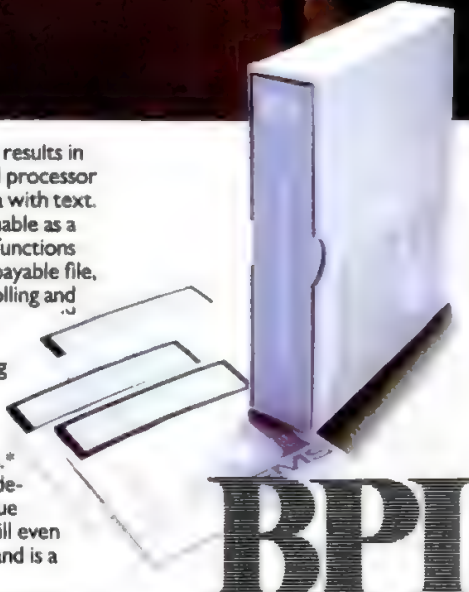
You can design math formulas and employ statistical analyses, then display the results in graph form. A self-contained word processor even enables you to merge file data with text.

In the office, the system is invaluable as a time-saving alternative to routine functions like maintaining an open accounts payable file, updating personnel records, controlling and analyzing fixed assets, creating detailed client information files and even customizing a time accounting system. And, through BPI's new File Transfer Utility Program, information may be retrieved from any of the BPI Accounting Systems.*

At home, the system will keep detailed files on bills and payments, due dates, and remaining balances. It will even store phone numbers and recipes and is a perfect appointment calendar.

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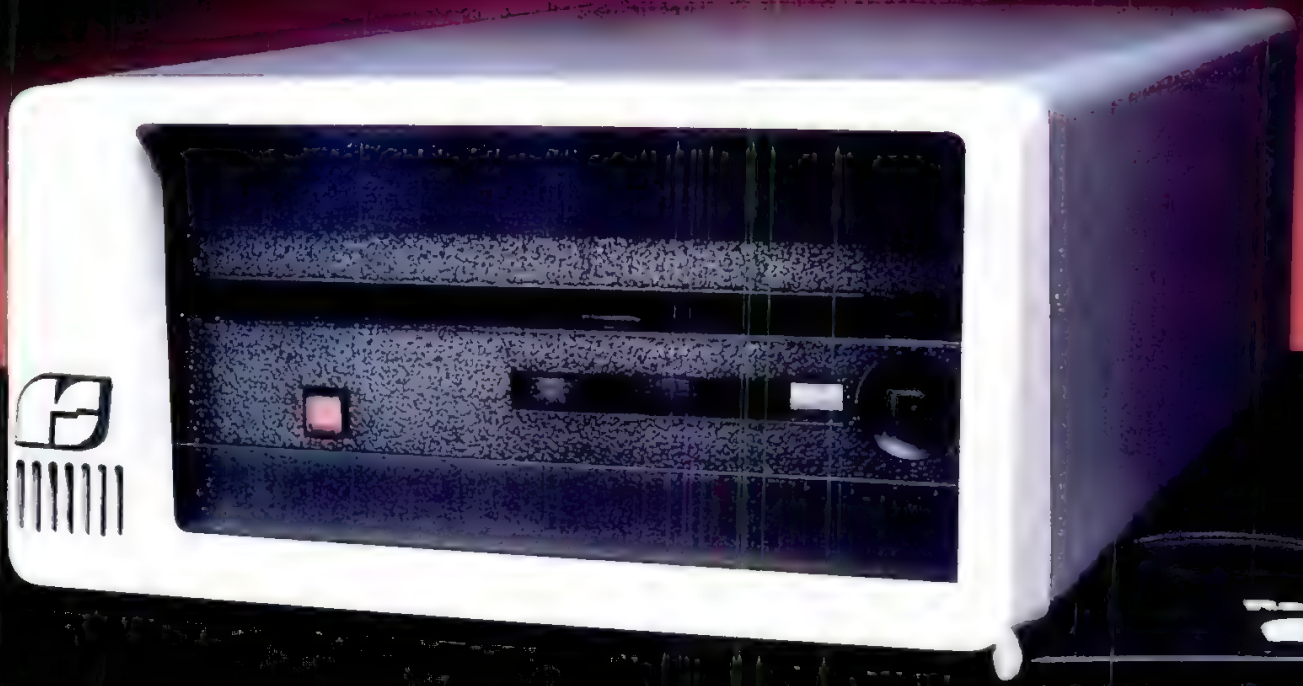
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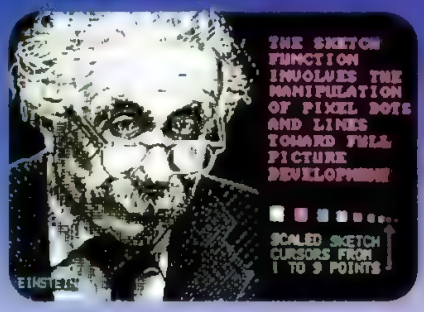
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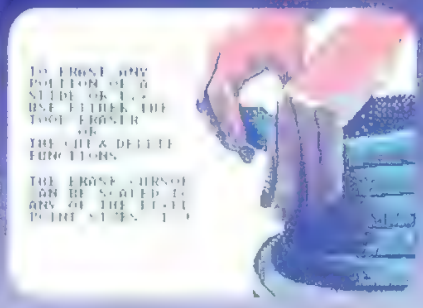
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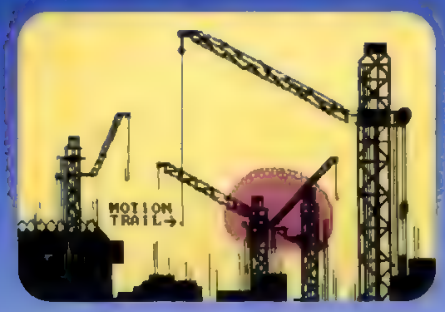
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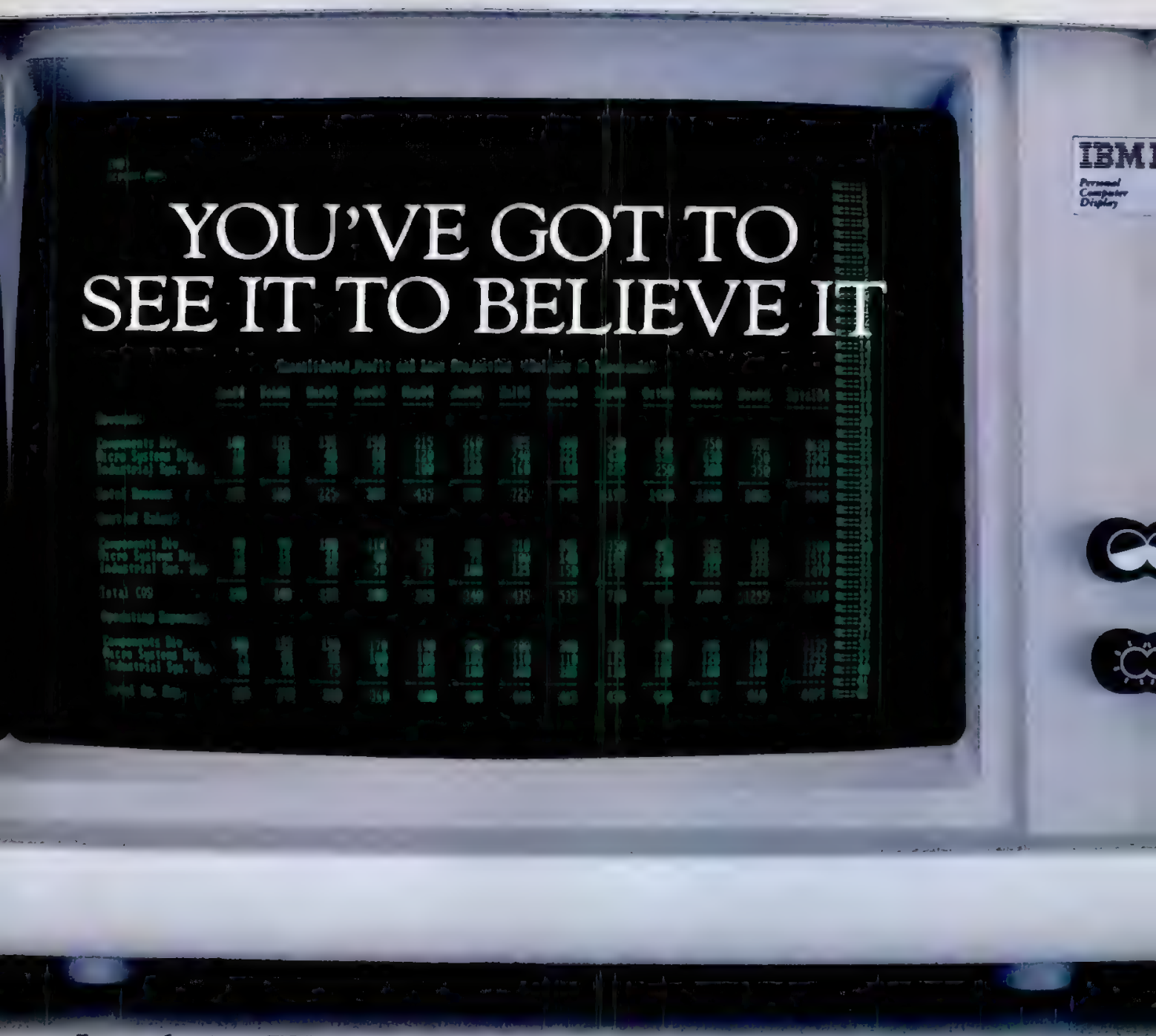
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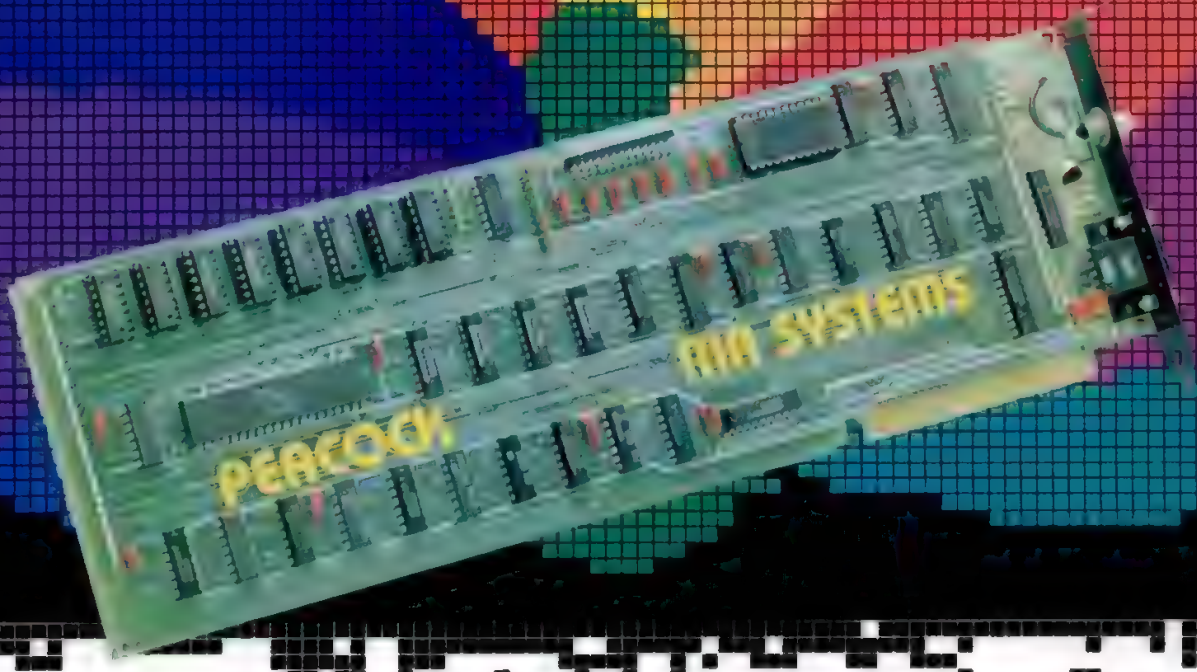
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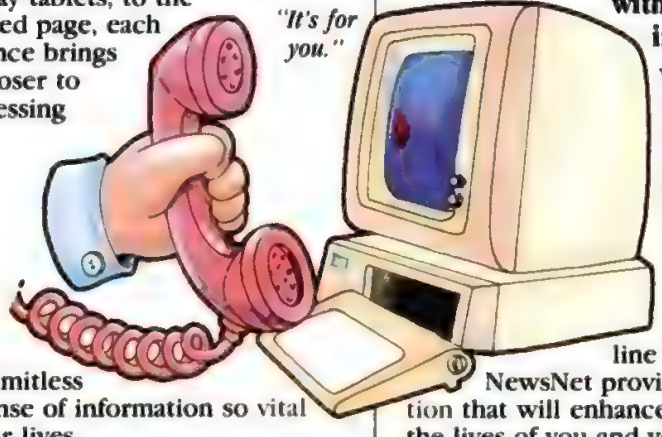


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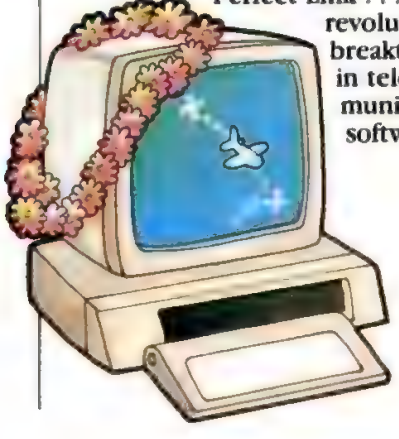
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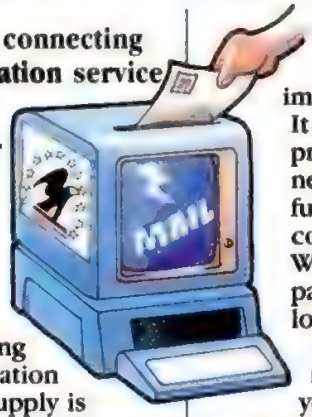
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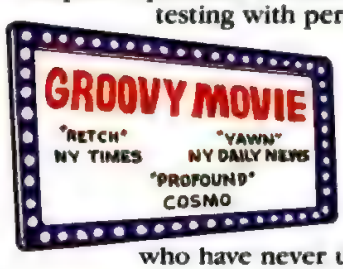
Not only is Perfect Link the easiest communication program available, it's also the best documented.

The Perfect Link manual introduces you to the many uses of communications software. It also introduces the major information services and describes what they offer.

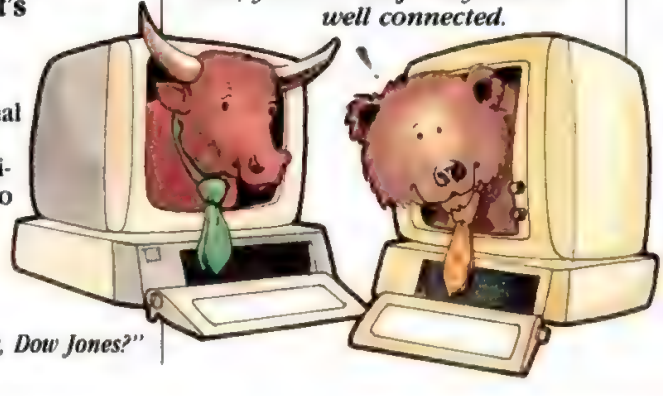
Written in straightforward English, it is immediately understandable. It tells you, simply and comprehensively, what you need to know to make full use of your computer's communication potential. With other communication packages, it often takes longer just to get through a couple of pages in the manual! With Perfect Link, you get started quickly, and you get started right. But don't take our word for it. Look at our manual and compare. Your choice will be an easy one.

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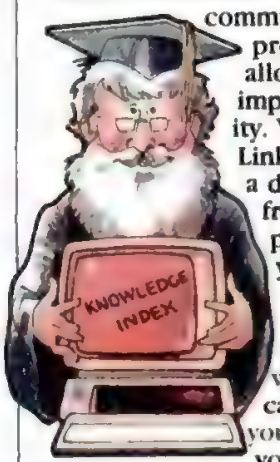
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***Perfect Link is currently available for the IBM PC, the Columbia MPC, Chameleon, Compaq, and other PC-compatible computers. It requires 128K. A CP/M version will be introduced soon.

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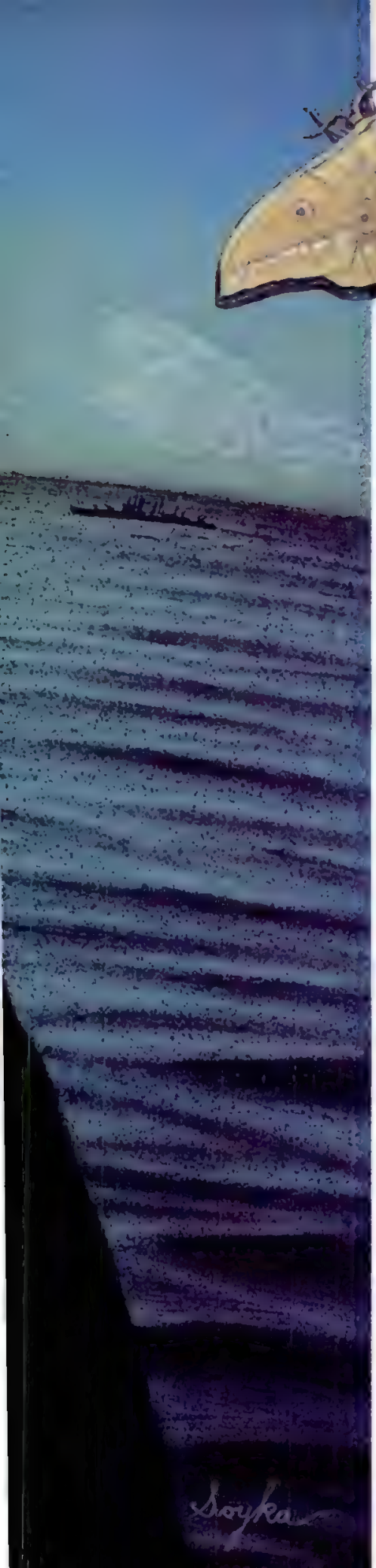
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HOPPER



INTERVIEW/COREY SANDLER

Captain Grace Hopper is a co-author of COBOL and a foremother of the computer revolution. As the oldest officer on active duty in the United States Navy, she can still rock the boat.

Keeping Up With GRACE

On the wall of her small corner of a small office in the Washington, D.C., Navy Yard hangs a framed antique copy of the Articles of the Government of the United States Navy. Navy personnel, from swabbies to admirals, refer to them as the "rocks and shoals." But for Captain Grace Murray Hopper, special adviser to the commander of the Naval Data Automation Command, and the oldest (and perhaps most famous) active-duty officer in the U.S. Navy, their framed presence points up a great irony lost on no one who meets her.

Captain Hopper loves to rock the boat.

"Somebody has to! There will always have to be a few people who will stick their necks out. Otherwise we'd never get anywhere," she said in a recent interview with PC.

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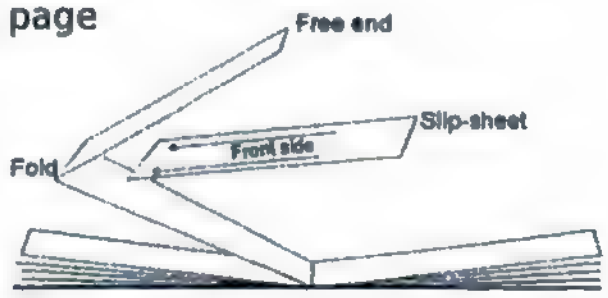
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PC CONNECTION™

Captain Hopper likes to define herself as the third programmer on the first large-scale digital computer, the Mark I, developed during World War II. This nonmicro—51 feet long, 8 feet high, and 8 feet deep—was a glassed-in kludge of mechanical relays and switches and vacuum tubes that could perform the astonishing feat of three additions per second. It was on the second version of this machine, and in Captain Hopper's presence, that the term "debugging" was born; it happened the day a technician repaired the failed computer by removing a squashed moth that had become trapped in one of the relays.

She is considered one of the creators of COBOL, a business-oriented programming language still in use today. She has served on numerous standards committees for hardware and software protocols that have defined the computer as we know it, and she now serves as the resident one-person think tank and "propagator of the faith" for the increasingly computerized U.S. Navy.

Born Grace Brewster Murray on December 9, 1906, in New York City, she claims as her second hometown Wolfeboro, New Hampshire, where she spent much of her childhood. She attended Vassar College in Poughkeepsie, New York, graduating in 1928 with Phi Beta Kappa and other distinctions. She went on to Yale where she received an MA in 1930 and a PhD in 1934. She returned to Vassar as an assistant in mathematics and eventually became an associate professor.

In December of 1943 she entered the U.S. Naval Reserve and attended midshipman's school at Northhampton, Massachusetts. Upon graduation she was commissioned lieutenant junior grade and ordered to the Bureau of Ordnance Computation Project at Harvard where she met Mark I. In 1946, she joined the Harvard faculty as a research fellow in engineering sciences and applied physics while continuing to work on the Mark II and Mark III computers for the Navy.

In 1949, she joined the Eckert-Mauchly Computer Corporation in Philadelphia as a senior mathematician and participated in the building of UNIVAC I. She remained with the company when it was purchased by Remington Rand and later merged into the Sperry Corporation.

Still within the Naval Reserve, she was successively promoted to lieutenant, lieutenant commander, and commander. At the end of 1966 she was retired with the rank of commander. She was recalled to active duty on August 1, 1967 and was promoted to the rank of captain in 1973. At the end of August of this year, Secretary of the Navy John Lehman forwarded a recommendation to President Reagan that she be promoted to the grade of commodore, "in recognition of Captain Hopper's continuing extraordinary contribution to both the Navy and the nation."

She is 78 years old in a "young person's field." She is a woman senior officer in a man's Navy. And she is truly one of the foremothers of the computer as we know it today, including the IBM PC.

I traveled to Washington with PC's technical editor, Bill Machrone, for a 90-minute opening of the tap of Captain Hopper's mind. We found Captain Hopper decked out in her dress blues, a demure hairnet holding her short white hair in place. She shared an ashtray, but not her unfiltered Lucky Strikes, with a petty officer who chaperoned the visitors from PC into her presence. She was surrounded by awards and memorabilia from the Navy, various universities, major computing companies and societies, and an assortment of photographs and prints of ships and naval scenes.

THE MODEL T was the beginning of a whole new world. I think you can say that the microcomputers are the Model Ts—people can own them.

The conversation ranged from IBM (she's not a fan), to superior officers and company executives (they need all the education we can give them), to her dislike of what she called the "elegant" but useless Pascal language, to bellbottoms and women's liberation.

PC MAGAZINE: According to your biography, you're an amateur genealogist. How did this interest develop?

CAPTAIN HOPPER: *Well, when my mother died, I found that she had started to do the family genealogy. So I thought I'd finish it. I now realize this will take more than my lifetime.*

PC: You started your work on a house-sized machine called the Mark I, and now we're talking about desktop or even lap-sized units that are thousands of times quicker, thousands of units more powerful, and so cheap as to defy price comparison. Would you like to take a stab at constructing a genealogy of the personal computer?

HOPPER: *We're still using some of the same things that were on the Mark I and the UNIVAC I. In fact, the UNIVAC I's instruction code is embedded in every code that's been written ever since.*

What I think we have today are the Model Ts. If you go back and look at the development of transportation, we had trolley cars which were fastened to the tracks. We also had tremendously expensive automobiles. They were individually built.

Then along came the Model T. It cost between $300 and $600, and you could have any color you wanted as long as it was black. And people started to own them. Now, I can remember sitting on Riverside Drive (in New York City) on a Sunday afternoon and watching all the beautiful horses and carriages go by. It was a dirt road. After we began to get the Model Ts, we blacktopped the roads, we built concrete roads, people moved to the suburbs. It was the beginning of a whole new world. I think you can say that the microcomputers are the Model Ts—people can own them.

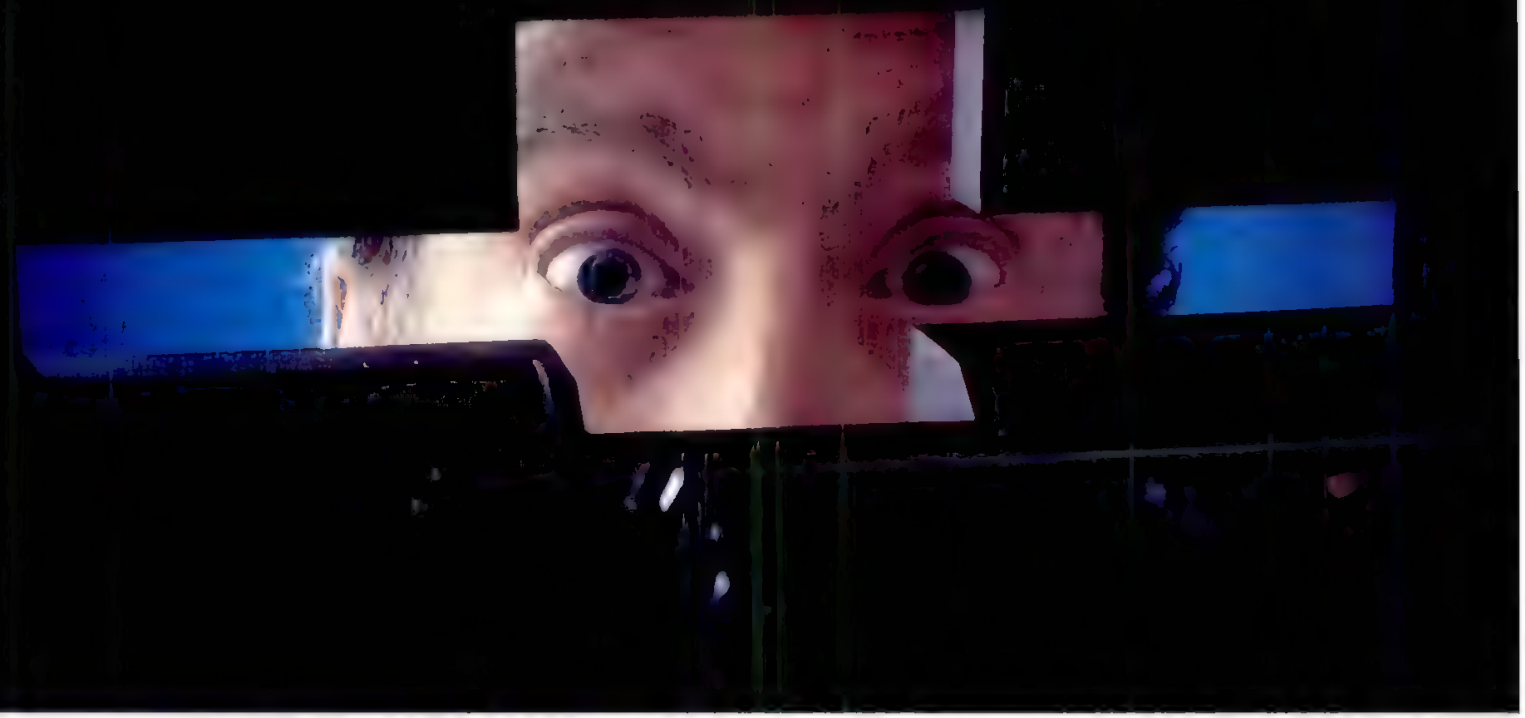
The first big change you're going to see is going to be in communications. Just as we blacktopped the dirt roads, the whole telephone system is changing. Goodness only knows what'll happen afterwards, because when we got the Model T, you couldn't have dreamed of a 747.

PC: The Model T was replaced by the Model A, which had a choice of colors, and a gear shift, and a few other bells and whistles. What will be the Model A of micros?

HOPPER: *I don't know. It hasn't happened yet. It may be these new ones that are driven by light instead of electricity. See, I couldn't have sat in Mark I and guessed about today's computers, because the transistor had to happen.*

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Entomological Etymology: The Birth Of 'Debugging'

Captain Hopper recalls the origin of one of the computer field's favorite "technical" terms.

"Mark II stopped, and they located a failing relay. The operator went inside and pulled a moth out of the relay and put it in the log book. He put Scotch tape over it, and under it he wrote, 'First Actual Debugging.'

"From then on, whenever Commander Aiken poked his head in the door, if the computer wasn't running we told him we were debugging the computer. The moth is still in the log book, under the Scotch tape, in the museum." —*C.S.*

Old-Fashioned Wisdom

PC: What do you think when you look at the PC?

HOPPER: *It's a little bit ahead of the Mark I. Mark I had 72 words of storage, and each word consisted of 23 decimal digits and an algebraic sign. And it did three additions every second. We can put Mark I on a chip now. And when you look at UNIVAC I, you had 1,012 words. So you had 12K.*

But I'll tell you something: I sure wish somebody'd build me a UNIVAC I today. I want a decimal machine. I don't want all these binary machines. I want to do data processing. I resent having to haul out, in decimal, the number of hours worked and the pay per hour, change them both to binary, multiply, change them back to decimal again, with the horrible decimal-to-binary-to-decimal roundoff. Why can't they build me a decimal machine, like UNIVAC I?

UNIVAC I was 8 bits. It was alphadecimal. Just think how nice it would be to have an alphadecimal machine for data processing. You know, 80 percent of the work that's done today is data processing, not scientific computation.

PC: Why can't Grace Hopper have her alphadecimal machine? Is it because of the effect of IBM's influence in the early days?

HOPPER: *Probably. Plus the fact that people don't change their minds. Look at 'em: They're going right to building them bigger and bigger and faster and faster. They'd do much better to build a system of computers and have them operate in parallel. We'd get much more done, faster. I think we'd beat the pants off the Japanese if we'd settle down and start building good systems for computers.*

I DON'T care if IBM puts them all in a big blue box. I want independent computers that can talk to each other.

My analogy is that back in the early days of this country, when they moved heavy objects around, they didn't have any Caterpillar tractors and they didn't have any big cranes. They used oxen. And when they got a great, big log on the ground and one ox couldn't move it, they didn't try to grow a bigger ox. They used two oxen.

It's just common sense. There's never any reason to put payroll and inventory on the same computer. None at all. We got that because we could only afford to own one computer. Now I don't care if IBM puts them all in a big blue box. I want independent computers that can talk to each other.

Let's have a database machine; so now you can have more than one database in the system, and more than one computer can access each database.

Now the next thing I'd like is a control machine. I want to get the overhead out of my computer. I want a control machine that takes over the job of all the operating systems. They could do it tomorrow, if they'd just sit down and do it.

PC: You've made your point about bigger not necessarily being better. But do you think smaller is better?

HOPPER: *Not necessarily. I just want systems that compute. I think there's a limit on making them smaller. I don't want to carry them around in my back pocket. I don't need to. Some people do. It'll probably upset all the airlines, though.*

Language Subsets

PC: You're well known in the computer field for your work on the COBOL programming language. Are you still working with that code?

HOPPER: *Oh, no. I'm looking toward things like Focus and RAMIS and Mapper. The nonprocedural language is the next step up.*

PC: Is there still a use for COBOL, though?

HOPPER: *Oh, yes. For things like bulk data processing. Things like inventory, payroll—bulk stuff. It'll be around for a long time to come.*

PC: Let's look ahead a bit on languages.

HOPPER: *One thing I think we should be doing is looking toward more specialized languages. If you go down to any library and go to the shelf that has dictionaries, you'll find one for biology, you'll find one for chemistry, you'll find one for insurance, and you'll find one on taxes—each one of which will contain a specialized area of mathematics and a specialized area of English. I think we ought to have more languages, more subsets to match those.*

FORTRAN was the basic one for math for engineers. Sines and cosines. Absolutely useless for the payroll guy. He never uses sines and cosines for computer payroll or inventory. But I think we could have subsets for each area. For instance, the mathematics used by people working in meteorology is quite different from the stuff used by the people working in chemistry. A person works in a particular field and uses the vocabulary and math of that field. That's what I'd give them.

What you're up against is the normal inertia of human beings. They don't want things to change. They don't want to have to make an effort and learn something, or do things differently. They're comfortable, so they fight it off.

Why didn't we start building something that would use the Laplace method for the solution of electric partial differen-

tial equations? It's much more accurate than matrix. NASA's got one, but they're not telling what they're using it for.

But there you've got 128 by 128 independent processors that can talk to each other. Now, if I had that for a Laplace solution, instead of sweeping that mesh the way we did back at the beginning, hitting every point at once, I could convert very rapidly, and, of course, I'd get a much more accurate answer than I ever would by matrix computation.

And now we're going backwards. Look, they are still writing variable length items. With all the extra coding to write variable length records, we only did that to save tape when our data was on tape. There's no sense in having variable length items, because when you send it to a disk, it makes them fixed length anyway.

So, why the hell are we going through all that extra computation of processing variable length records? To save tape?

If we went back to fixed length records, so that everything had a particular position in the records, then if you wanted to find all the men over 50 who were paid more than $20,000, you could go right down one column. Now you've got to pull out every record and look at it.

PC: You mentioned earlier that the United States could beat the pants off of the Japanese.

WHY IN the name of heaven the British don't export software, I'll never understand.

HOPPER: *If we go to systems of computers and systems of databases, we could do it tomorrow.*

PC: Could the Japanese beat the pants off of us?

HOPPER: *I doubt it. They've had major difficulty in writing software. They did develop the technology for the new 256K chips. But they haven't put out an original processor chip.*

The best software, of course, is British. Why in the name of heaven the British don't export software, I'll never understand.

PC: What makes British software work so well?

HOPPER: *It's efficient, it's effective, it's well conceived, it's well structured. It's everything you'd like it to be. It's elegant, too, which is rare.*

Matters of Elegance

PC: The September issue of PC was devoted to a survey of microcomputer programming languages, and much of the writing involved the search for something called "elegance" in programming. What does that mean?

HOPPER: *Look at the catalogues written in different countries in Europe. Go look at the same programs for the same computer. The German programs plod*

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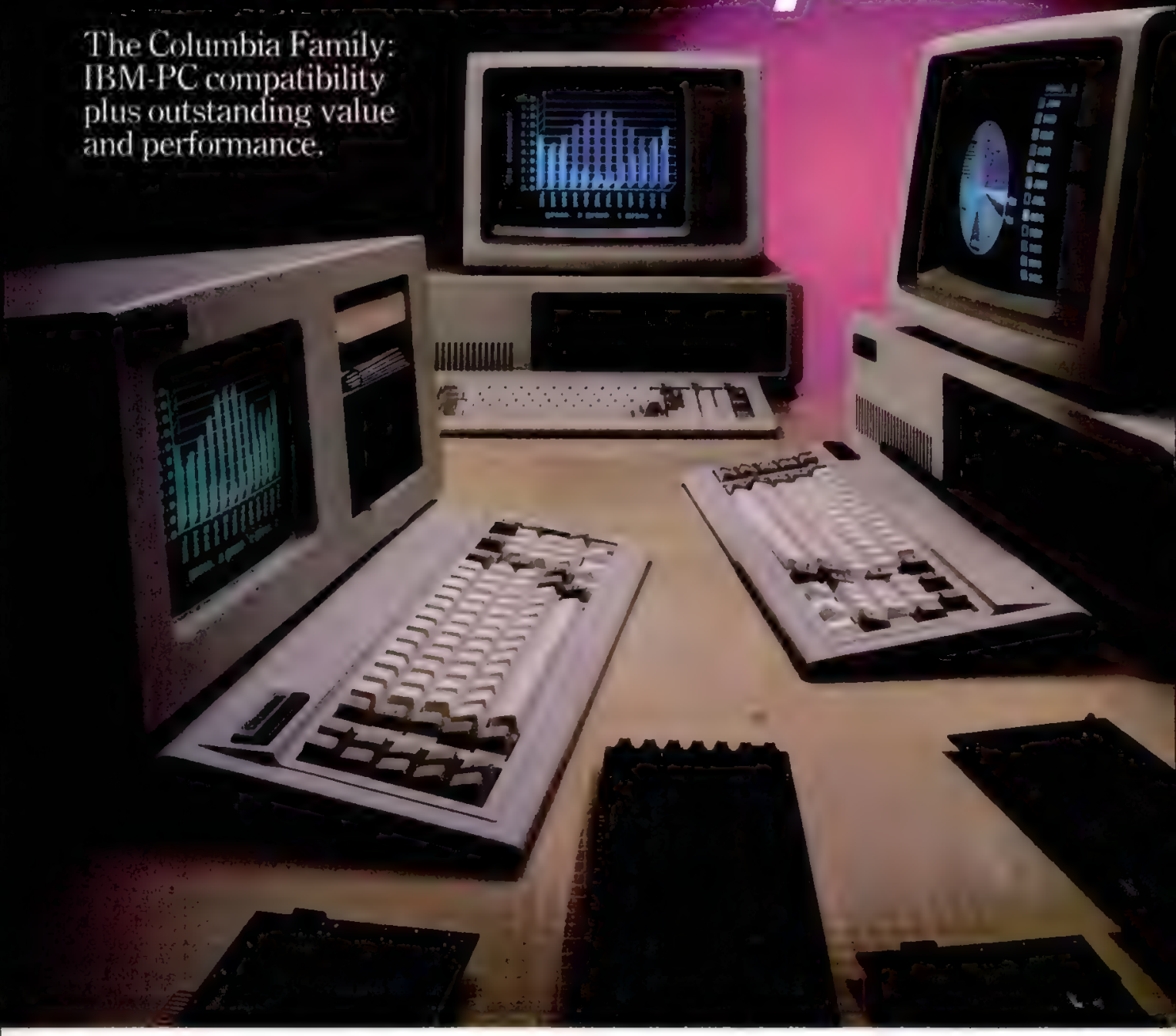
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along, and they cover every single case in detail. If there's only one case, they still do it on the computer. They don't fill it out and do it by hand.

The Italian programs—it's a miracle they ever run. They do them in small pieces. It jumps all over, it goes flying around, and you wonder how in the name of heaven those things ever run. You've never seen anything like the difference in the style of writing a program from different countries.

PC: What about the different languages themselves? Are any of them elegant?

HOPPER: It depends on who uses them. You can write elegant programs in COBOL and absolutely lousy programs in COBOL. The same is true of any language.

Of course, I'd go back and make people draw at least a block chart, if not a flow chart, so they know what they're doing before they start to write it.

PC: What about BASIC? It's the lingua franca of the micro.

HOPPER: I think it's very good, because there's no difficulty at all in moving from BASIC to FORTRAN or BASIC to COBOL. It's the same structure. People can go right forward in them. So, I'd start all the kids on BASIC.

PC: What about the apparent preference in the academic community for Pascal as the standard teaching language?

HOPPER: It's very "elegant." It doesn't handle files, and it doesn't handle the database. What's the use of learning a language you're not going to use?

PC: So what is Pascal good for?

HOPPER: If you want to do weapons systems, the better thing to do is go to Ada. If you want to do data processing, you go to COBOL. If you want to do scientific calculations, you go to FORTRAN. If you want to do simulation models, you use LISP or something like it.

Pascal's "elegant." That's the only thing you can say for it.

PC: I've never heard "elegant" used as a pejorative or pronounced in quite that way.

HOPPER: What happened was that back in the beginning, it was all mathematical solutions. Then applied mathematics began to draw the students away from the math departments at the colleges. So the math departments promptly called those courses "vocational." They weren't scientific enough.

So the computer people named themselves computer scientists and went off the deep end of being scientific, never doing anything which could possibly be contaminated by anything practical. And the results are things like Pascal.

PC: And so, Pascal is the language of the ivory tower?

HOPPER: Exactly.

PC: What about the physical location of software? Will it become part of the hardware?

HOPPER: There will always be new questions asked; there will always be new problems. Somebody will always have to write the basic stuff that takes those bits and bytes out of the hardware.

PC: So there will always be jobs for programmers?

HOPPER: Yes, because everybody does everything differently. Have you ever seen two banks do anything alike?

PC: Unfortunately not.

HOPPER: For instance, I once expected that the American Bankers Association would sit down and write all their software for the stuff that the banks have to report to the federal government. And then they'd rent it out to all the banks. It's never been done, because they don't keep all their basic policies in the same way. Insurance—you'd expect the same thing there. No. They all do it differently; they call things by different names. People are people.

PASCAL'S "elegant." That's the only thing you can say for it.

PC: Why is the U.S. Navy in the computer business? How did it happen that you're here at the Office of Naval Research?

HOPPER: It started with missiles and ordnance. Up until World War II, when you had a mine, it had horns sticking out of it, and a ship had to hit the horns to make it go off. During World War II, we developed acoustic and magnetic mines. The minute we had that, we had to know how far their influence spread, so as to know how to lay them. And as soon as we did that, we had to know where to tow a dipole to get them back. Tremendous amounts of computation.

PC: What is the Navy doing with computers today? Missiles?

HOPPER: Well, not only the missiles, but navigation and everything in the hull. This new ship, the Carl Vinson, for instance, probably has the finest local area network anywhere. The captain of the ship was a very bright man, and he insisted they put in the cables when they built the ship.

PC: He probably saved the taxpayer a lot of money.

HOPPER: But you see, he was thinking ahead. We're beginning to get the youngsters coming up in rank with some contact with computers.

PC: In your assignment now, do you get to lay hands on a computer every once in a while?

HOPPER: I rarely bother with them. I don't have any reason to use them. Eventually, I shall have a computer at home for the work I do in genealogy. There's a magazine on genealogical computing!

Privileges of Age and Sex

PC: How does it feel to be the highest-ranked woman in the Navy? Is your sex and your white hair an advantage?

HOPPER: I'm not a woman's libber. I have no desire to be liberated at all. I'll have all of my privileges, thank you, and use them too.

PC: Has it ever been a disadvantage?

HOPPER: Never, as far as I'm concerned. I've never run into it. I was too busy getting things done.

PC: Do you object to people asking you when you're going to retire?

HOPPER: Oh, I told the admiral I'm going to stay on that computer until I die, because then he'll have to pay for my funeral. I'm of Scots ancestry, you see.

PC: Doesn't it bother you, though, when people just assume that because you're of a particular age you should be out?

HOPPER: I've been retired. I don't have to worry about it. The Navy retired me on 31 December, 1966, and UNIVAC retired me in absentia in June of 1971. I don't have to worry—I've been retired.

PC: The Secretary of the Navy has forwarded a recommendation to President Reagan to promote you to the rank of com-

modore, a flag officer. How do you feel about that?

HOPPER: *It scares me out of my wits. Being a captain was just right. Just enough to say and not too much. The responsibilities of being a flag officer are greater.*

I mean, what would my great-grandfather say?

PC: Your great-grandfather was Rear Admiral Alexander Wilson Russell, who served under Commodore Perry in Africa, as the clerk of naval affairs to the U.S. Senate, paymaster of the U.S. Navy, in various Indian wars, in action during the Civil War . . .

His biography reads like a chapter in an American history textbook. Don't you think he'd be proud of his great-granddaughter?

HOPPER: *I don't think he'd approve of females in the Navy. He was firmly convinced that women and black cats aboard ship were bad luck.*

PC: I've known people to change their minds once or twice in their lives.

HOPPER: *Well, he died back in 1908. I doubt if he's had time to change his mind. And it is true. I mean, women aboard ship have been bad luck. And now, if you ask me, they're a damned nuisance. Extra heads, extra berthing, extra everything. Hanging pantyhose over the pipes!*

The better way is the Coast Guard way, where an entire crew is female on some of the cutters.

But there's no need to go on combat ships. I'm totally against women in combat, because we live in a culture and a society that imposes on every man the concept of women and children first. Sure, there are some breakdowns in New York City streets, but that's the instinct. And I've seen it work. If you had a man and a woman trying to go through some dangerous woods, the man's instinct would be to protect the woman. Therefore you weaken the man. Until the whole culture changes, I don't think they should go into combat. Because it weakens our men.

PC: What about women and computers, in and out of the military?

HOPPER: *Programmers have never been characterized as male or female.*

PC: But many people say that within society, women seem to be hesitating to jump into the expanding computer world now.

HOPPER: *That's their tough luck. The openings are there. If a woman doesn't go out, it's because she didn't go and do it.*

I'M totally against women in combat, because we live in a culture that imposes the concept of women and children first.

Educating Superiors

PC: I read an interview with you in which you were talking about the responsibility of the lower grades to educate their superiors.

HOPPER: *That's part of the job. Well, you look at the top men in any company or look at our top admirals. Look at the size of the reports they have to absorb. They haven't got the time to go out and study electronics. We've got to feed it to them. The same is true of any large company. You've got to continue to educate your superiors.*

In the Navy, we've gone back to bell-bottoms and white hats and the chiefs are going to run the Navy again. You see, the enlisted look up to the officers, and the officers look down on the enlisted, but the chiefs are the ones in the middle. I once had an admiral who didn't have a chief. I stood it for about a month and then I went over to see the admiral, and I said, "Dear, kind Admiral. Will you please get a chief?" And he said, "Why?" And I said, "Because there's absolutely no way of managing an admiral unless he has a chief, because the chief tells him what he can and can't do."

PC: Why did you never go to work for IBM?

HOPPER: *Back in 1949, IBM invited me to their New York headquarters for an*

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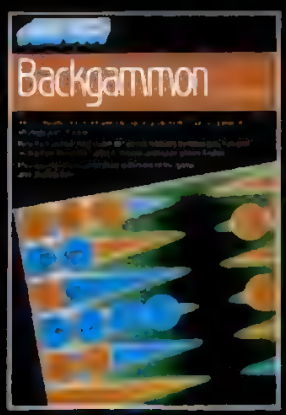
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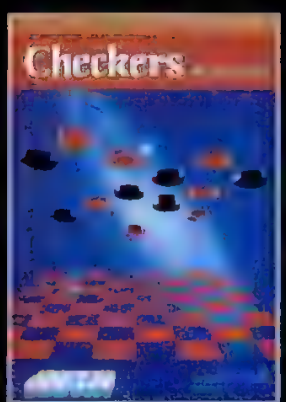
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interview, and they gave me a yellow form. It was legal writing, four pages, both sides. I got down to the front of the first page and halfway down the second page, and in the next room the salesmen started singing a song about dear Mr. Watson, from whom all good things come. And I picked up the blank and gave it to the personnel man and told him I wasn't about to work for any company that sang hymns to a human being and I left.

I'm sorry they broke up AT&T.

PC: You're wearing a Cheshire cat smile. Why?

HOPPER: *They could have broken up IBM.*

PC: Please continue.

HOPPER: *Because it's much more dominant in the industry. And that's not good. Fortunately, as far as the micro is concerned, enough got into action before they woke up. I think they were all "bigger is better" oriented.*

PC: What about the IBM PC? Some people say that the entry of IBM legitimized the market. On the other hand, IBM seems to have just ridden over anything else out there.

HOPPER: *Well, that's because you pay half the money for the hardware and half the money for the three letters on the front. You can buy the same amount of hardware with the same abilities for about half the price, but they're playing their usual game.*

PC: But they're producing that Model T you were looking for.

HOPPER: *Oh, I think I'd take a DEC Rainbow any day. And I'd much rather have a Hewlett-Packard. Better hardware. Much more reliable. Much better built.*

PC: What's your opinion of PC-DOS and CP/M?

HOPPER: *Well, I rather like CP/M. The interesting thing is Gary Kildall was a Navy officer.*

PC: And yet IBM did not embrace CP/M, relegating it to distant second place on its micro.

HOPPER: *It's more flexible, it's more open to expansion and growth. It's more ready to move into the future, and that's what we should get into. UNIX is another very good one.*

* * *

The petty officer signaled to us that our allotted time had passed—in fact, we had gone on way past the agreed upon hour, but Captain Hopper seemed to be enjoying the opportunity to talk about computers and programming in an interview, instead of a discourse about her age and sex. She tossed off one parting crack about the professors in the ivory towers as we packed up to leave.

"See, I'm a math professor gone wrong," she told us. "I was an associate professor of math when I joined the Navy and met a computer. I think I should have been an engineer, because my interest is in making things work."

Be that as it may, Captain Hopper ended up as a most important foremother of the computer revolution we are all—she included—enjoying today. */PC*

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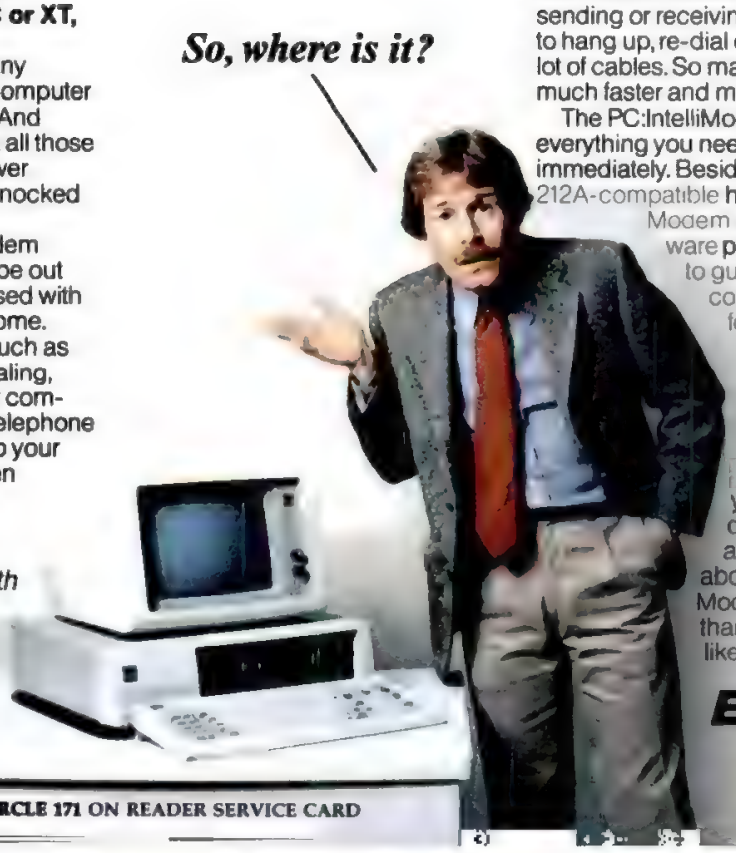
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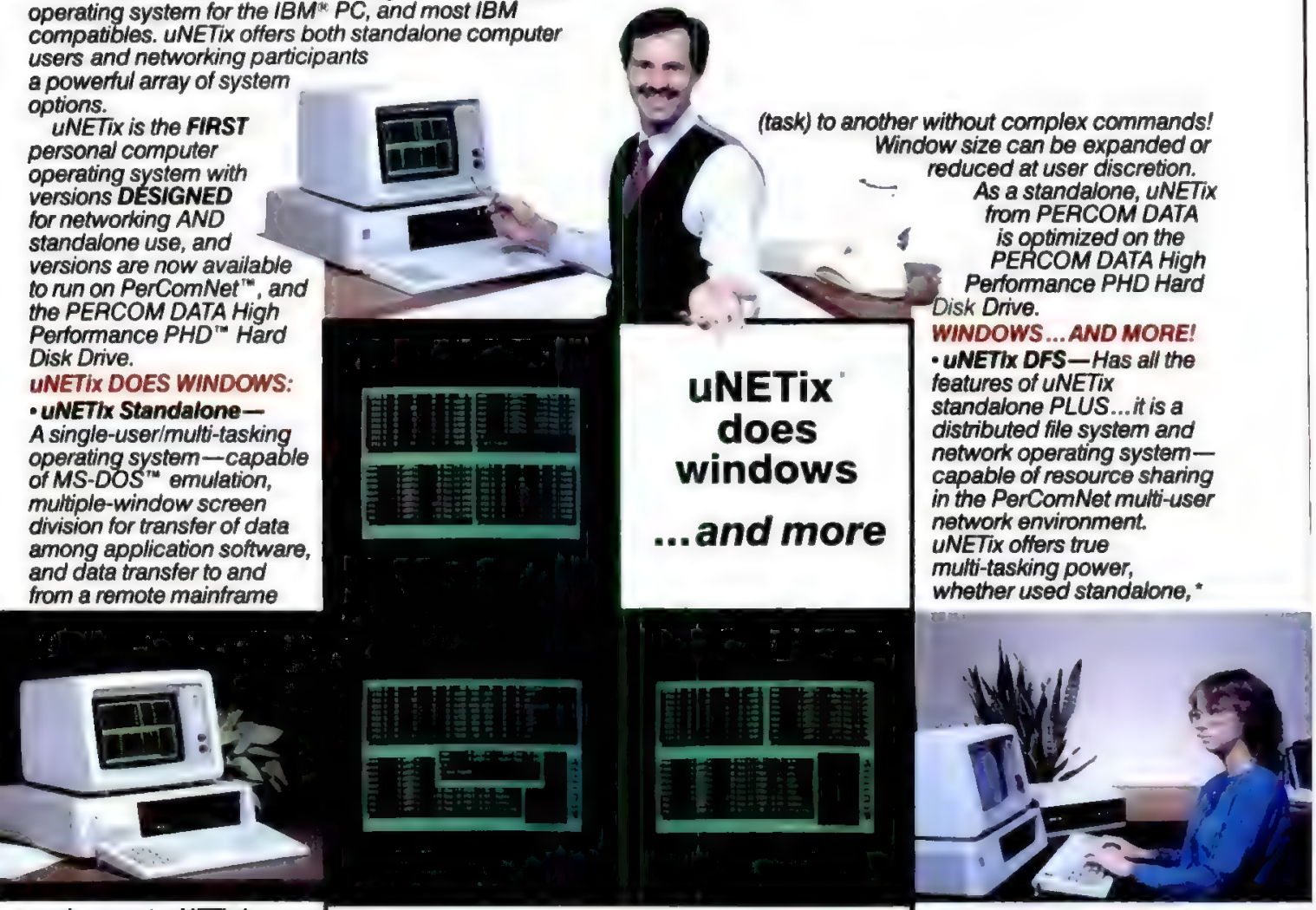
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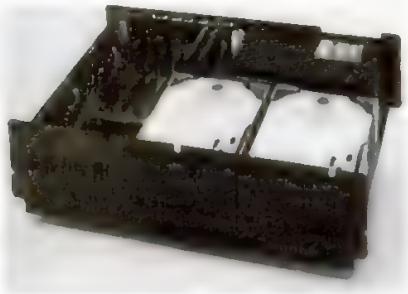
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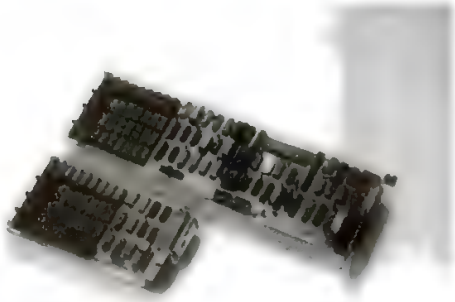
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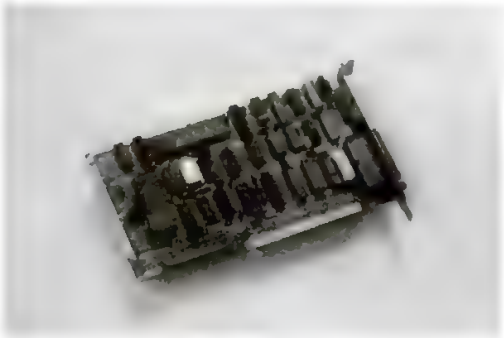
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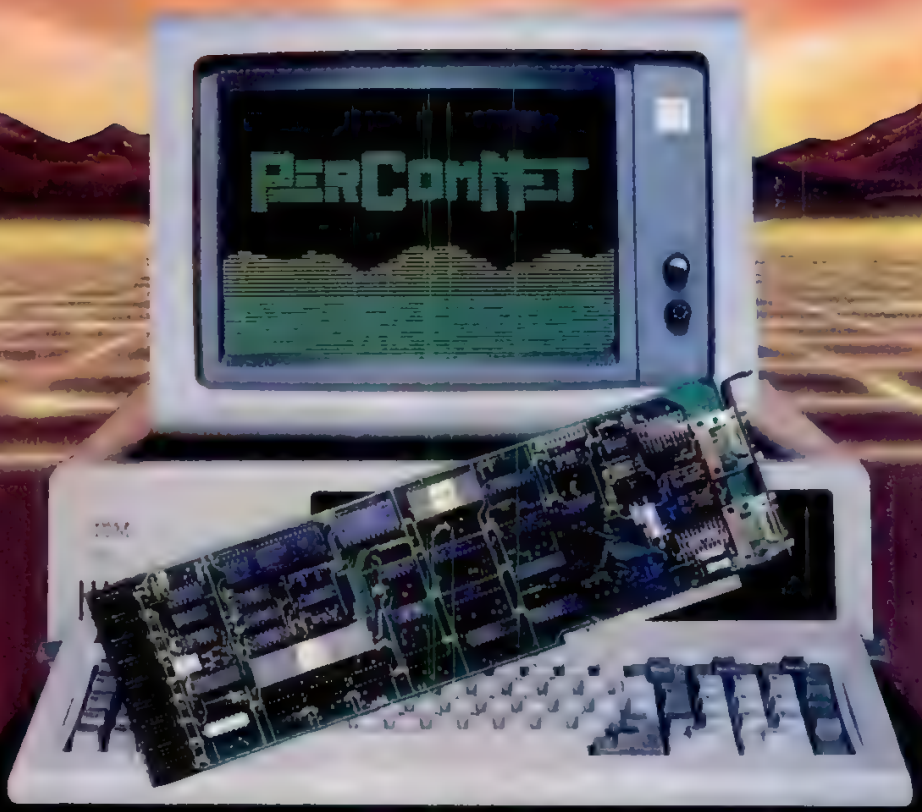
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MegaPlus II™

THE ULTIMATE EXPANSION FOR IBM* PC OR XT

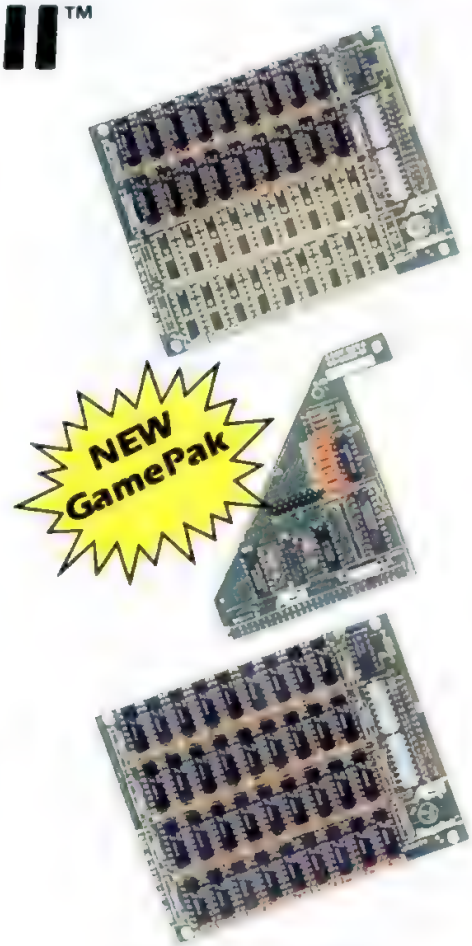
This **really** is the only board you need to expand your IBM PC or XT. There is quite a selection of multifunction boards available today, with many of their manufacturers trying to pile up the score of so called "functions". But when you look to see what they do you find some real creative definitions of "function" as well as some pretty useless features. MegaPlus II has the features you need on a board that is cost effective, versatile, and reliable. You can start out with the basics as standard equipment, and can add features as the need arises. Or you can get it all right now — in one slot.

THE BASICS

MegaPlus II has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments, clock/calendar with battery back-up, asynchronous communication port (RS232C serial) which can be used as COM1 or COM2, (DTE for a printer, DCE for a modem). Also included are SuperDrive™ disk emulation and SuperSpooler™ printer buffer software. Optional is a 100% IBM compatible parallel printer port, and a second async port for another $35 each. Both options are socketed so you can add them later should the need arise.

CLOCK/CALENDAR & CLIP-ON BATTERY

Our clock is powered by a simple $4 lithium watch battery. It is clipped on, not soldered like some other clock boards. How useful is a battery warranty that requires you to send your board to the manufacturer to replace it? We send you a diskette with a program that sets the time and date when you turn on your computer. Now your programs will always have the correct time and date on them without you ever having to think about it. (Just which version of that program you were writing is the latest one?)



THE MEGAPAKS

The pictures show the optional 256k MegaPak™, the 128k version, and the new game pak. These boards mount "piggyback" on the MegaPlus II. The 256k MegaPak gives the old style PC's with only 64k the ability to add 512k of memory in one slot. The 128k MegaPak is for the new machines that can hold 256k on their PC's motherboard. This board along with the 256k on the MegaPlus II gives you the total of 640k, the maximum usable under 2.0 DOS. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have plenty of memory for your biggest programs. There is a new game port MegaPak option. It uses any IBM compatible joysticks or paddles. It plugs onto the pin connectors just above the edge connector so you can add one even if you have one of the memory MegaPaks.

FREE SOFTWARE

SuperDrive™ disk emulation software creates "disk drives" in memory which access your programs at the speed of RAM memory. SuperSpooler™ print spooler allows the memory to accept data as fast as the computer can send it and frees your computer for more productive work. Both programs are compatible with 1.1 and 2.0 versions of DOS.

CHEAP SOFTWARE TOO

What good is great hardware without some great software to use it with? We offer some terrific prices on some of the popular programs you will want to use your board with. How about the cream of the spreadsheet programs, SUPERCALC², for just $159. Or maybe dBASE II by Ashton-Tate for just $409. We now have the new standard for word processing programs, SUPERWRITER for $179. It combines a very powerful, yet easy to use word processing program with a spelling checker and the ability to do mailing list/form letter generation.

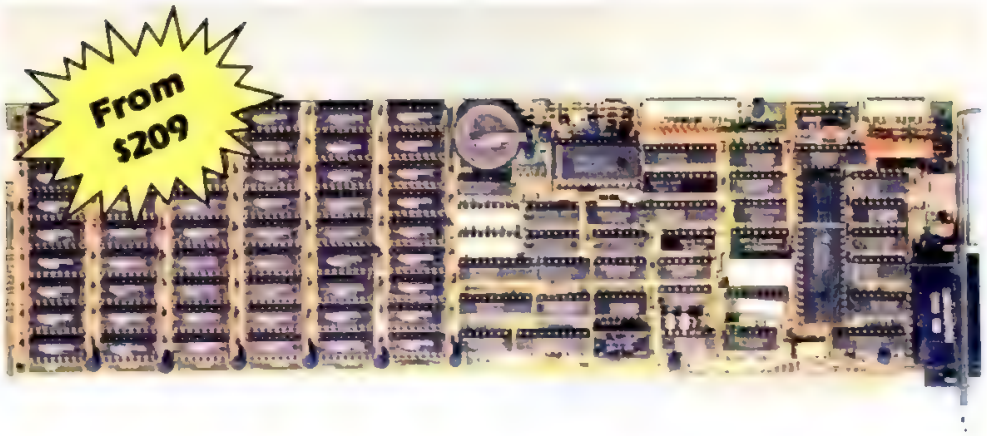
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Qubie' (say cue-bee-A) gives you a 30 day satisfaction guarantee on all board purchases. If you are not completely satisfied we will refund the entire cost of your purchase as well as pay the postage to return it. If you can get one of our competitors to give you the same guarantee, buy any other board you think compares and return the one you don't like. We're not worried because we know which one you will keep. We also offer a one year parts and labor warranty. An additional one year extended warranty is available for $50.

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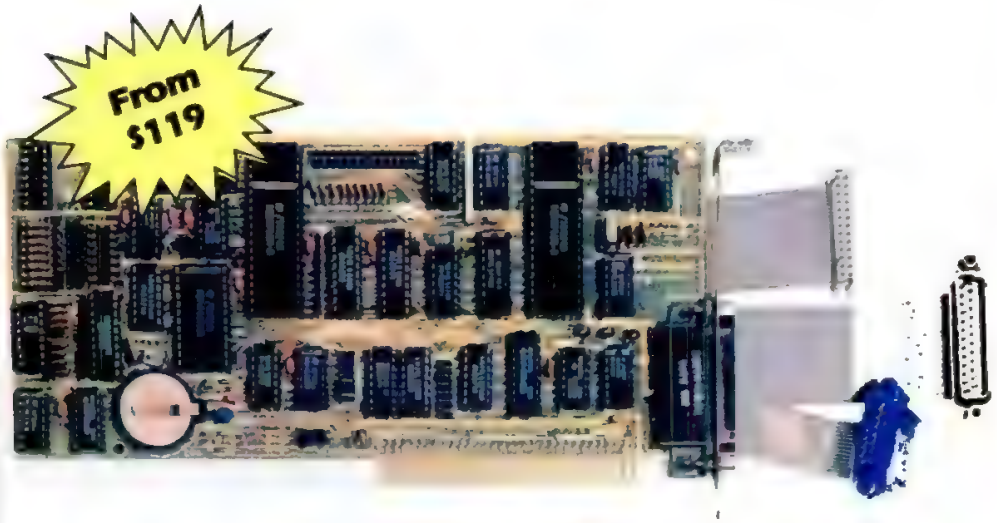


THIRSTY FOR 384k? HAVE A SixPakPlus™

Since the introduction of PC DOS 2.0, the capabilities of the PC have been increased with the ability to address up to 640k of memory. With the current PC having 256k available on the computer motherboard, you need another 384k to reach 640k. Great you say, but multi-function boards only have room for 256k on them. Enter the SixPakPlus™. Not only does it hold up to six banks of 64k parity checked RAM, but includes battery powered clock/calendar, serial port, parallel printer port, SuperDrive™, and SuperSpooler™ software standard. Optional is an IBM compatible game port. And of course you get the "Plus" of AST engineering and reliability, and the service and support of the largest dealer in the world for AST products.

SPECIAL OFFER

Buy a 384k SixPakPlus™ with game port and get a FREE ConnectAll cable bracket.



I/O-Plus II™: MEGAPLUS SANS MEMORY

Here is the answer for those who don't need additional memory but would like all those other quad-function board features. The I/O-Plus 2 comes standard with a clip-on battery powered clock/calendar, an asynchronous communication port (RS232C serial). Also included are the SuperDrive™ electronic disk and SuperSpooler™ print spooling software. Optional is a second asynchronous port (DTE for a printer, or DCE for a modem), a parallel printer adapter, and the best game paddle adapter on the market. What's so special about our game adapter? Not only is it an IBM standard game port, but it can also use low cost, widely available Apple compatible paddles and joysticks. And like its big brother MegaPlus, all the options are sock eted so you can buy them later if the need arises. So if your memory needs are satisfied, I/O-Plus 2™ gives you all the input and output ports you might need — for less than the price of most single function boards. 30 day satisfaction guarantee in cluded.

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PRICES:

I/O-Plus 2™ with Clock/calendar, serial (asynchronous) port, SuperDrive™ and SuperSpool™ - **$119**

MegaPlus II™ no memory, with clock, serial, and software - **$209**

SixPakPlus™ no memory, with clock, serial port, printer port, and software - **$209**

Each 64k of memory installed and tested on MegaPlus, SixPakPlus or alone	$55
Parallel Printer Port	$35
Second Asynchronous Port	$35
Game Adapter (I/O or SixPakPlus)	$35
MegaPak™ with 256k of Memory	$299
128k of Memory	$199
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There's even a Time Spectrum board for the Texas Instruments PC.

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For the IBM PC, Compaq and Columbia, maximum capability in minimum space.

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Up to four I/O ports—in just *one* slot.

How did we do it?

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And only Persyst has it.



The Time Spectrum Cliffhanger™
So ingenious, it's patented

What's more, expansion functions can be plugged right onto the Time Spectrum board. Or added with Versapak™ piggyback modules. So you can add exactly the capability you need, when you need it.

Extra flexible expansion for the IBM XT.

For the IBM XT, Time Spectrum not only delivers exceptional one-board expansion capability, but extra flexibility, too.

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Now there's even a Time Spectrum multi-function board for your TI PC. With it, you can add up to 512K RAM, two serial ports, calendar clock and light pen port—capability to handle even the most complex and difficult computing functions.

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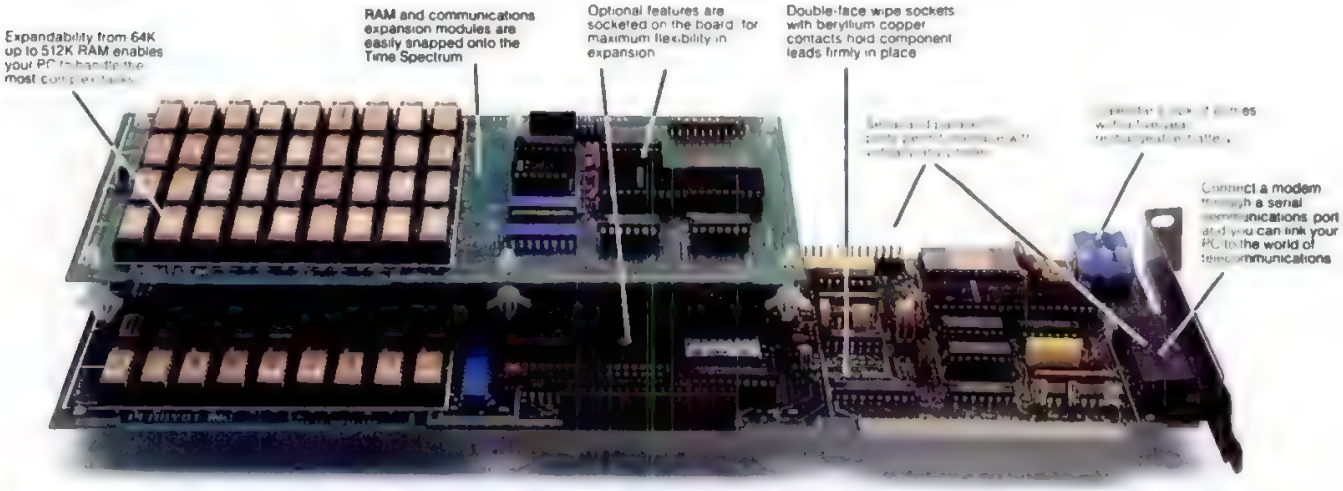
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PERSYST™

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TECMAR'S GRAPHICS MASTER.™

It adds graphics to your IBM Monochrome Display, or 16 high-resolution colors to your color monitor!

NEW IMPROVED!



Text *or* high-resolution graphics on the IBM Monochrome Display

Amazing new resolutions on standard color monitors

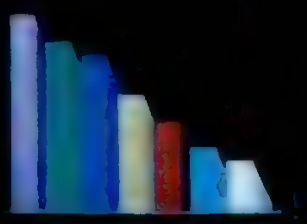
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On standard low-scan color monitors:
- 640 horizontal x 400 vertical in 16 colors
- 720 horizontal x 480 vertical graphics in 4 colors.

On the IBM Monochrome Display:
- 720 horizontal x 700 vertical
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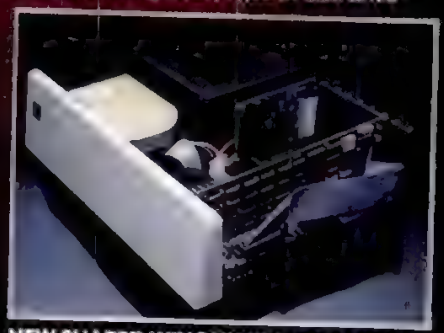
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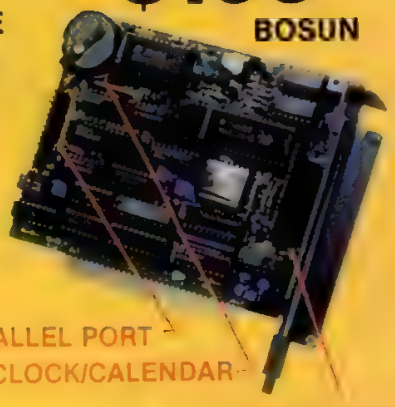
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WAVE fits into a short slot in the IBM PC/XT.

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- **PARALLEL PORT** for printer - PC compatible (LPT1, LPT2)
- **RAMSPOOLER** - easy to use - allows printing to become background task
- **SPEED DISK** - simulates ultra high speed disk
- **AUTO-TIME** - provides automatic insertion of date and time at power on
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These features are the same as described for the Captain.

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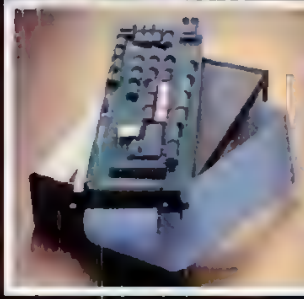
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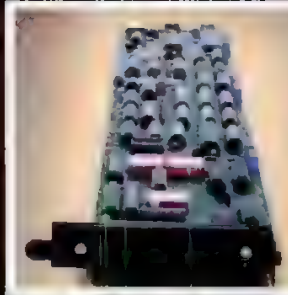
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Software For The Bull And Bear

Dow Jones, the company that built an empire on business and financial news, is branching out into software. After your morning *Wall Street Journal* and a glance at the AP-Dow Jones news wire, you can fire up your Dow Jones software, tap into the Dow Jones News/Retrieval network, and let your PC analyze securities and keep track of your stock portfolio. Except for a grubstake, a computer, and a little inside information, Dow Jones offers almost everything you need to help you make a killing in the market.

The two programs Dow Jones has released for the PC have two very different purposes. *Market Analyzer* is a graphing and charting tool for technical analysis of securities. By pinpointing trends and patterns in a stock's past behavior, the program is designed to help you predict its future. *Market Manager*, on the other hand, is mainly for recordkeeping. It is doubtlessly of great use to anyone who must keep track of trades in many portfolios at once, but sophisticated users will

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Dow Jones Market Analyzer
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P.O. Box 300
Princeton, NJ 08540
(800) 257-5114
List Price: $350
Requires: 64K RAM, color graphics card and monitor, one disk drive, serial port and modem, Epson printer with Graftrax.

CIRCLE 673 ON READER SERVICE CARD

Dow Jones Market Manager
Dow Jones and Company, Inc.
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Princeton, NJ 08540
(800) 257-5114
List Price: $300
Requires: 128K RAM, two disk drives, serial port and Hayes Smartmodem, printer.

CIRCLE 674 ON READER SERVICE CARD

soon discover its limitations. Both programs are designed to tap directly into the Dow Jones News/Retrieval (DJN/R) network (see sidebar, "Dialing for Dollars: Talking to Dow Jones.") *Analyzer* goes on line to pick up historical stock data and *Manager* uses the system to track fluctuations of current prices.

The Latest and the Best

Analyzer and *Manager* were originally released to run on the Apple. Thus, PC users are not the first to get Dow Jones software, but they are the ones to get the latest and the best. These programs still have some odd quirks, but they are, as we shall see, an improvement over the rough-and-ready stuff that runs on the Apple.

Market Analyzer comes in two basic modules: one for retrieving stock data and another for manipulating and graphing it. Data retrieval is a slow, cumbersome process, but the tedium all seems worthwhile when the program starts churning out charts and graphs.

After you have gone through a straightforward setup procedure and initialized a data diskette, you are ready to enter the list of stocks you would like the program to analyze. This is a simple procedure. Securities are entered according to their trading symbol—BA for Boeing Aircraft, LK for Lockheed, IBM for IBM—along with some other indicators that are needed to help the program do its work.

Although *Analyzer* is not difficult to use, it is not patient with indecision or mistakes. First it wants to know the total number of stocks you wish to analyze. Then it continues to ask you for stocks until it has arrived at that number. You can't change your mind and add a few more or decide to leave several out. If you tell the program it is getting 20 stocks you had better have 20 to give it. There is also no way to go back and correct errors during the entry procedure for stock symbols. You have to go to a different menu selection if you want to change anything. A more thoughtfully designed program would allow you to make corrections en route and to dispense with the restriction to provide, in advance, the total number of stocks you wish to analyze.

Once the stock symbols are entered, the program automatically branches to the DJN/R log-on procedure to fetch the historical data you need. Out of all the information available from Dow Jones, *Analyzer* works its wizardry with just four figures for each trading day: close, volume, high, and low. You needn't even track all four; if you need only the close, or the close and volume, *Analyzer* will fetch only those values. The program also allows you to limit the historical data you wish to collect depending on the time frame you are interested in. You can go back as few as 12 days or as many as 264 if you so desire.

There are several advantages in using as little data as possible. If, for example, you are collecting only 120 days worth of historical data, you can store 100 different stocks on a single data disk. But if you are using a 264-day time span, you can store only 50 stocks. Also, the more data you collect, the longer you remain connected to Dow Jones. Even if connect time were free—which it isn't—it's boring to sit and wait while your program fetches historical data. To get the full 264-days worth on just one stock takes *7 minutes* at 1200 baud: plenty of time to walk the dog or make a sandwich.

Even when that marathon procedure is over, you're not home free. If you want your charts to be perfectly up-to-date, you need current as well as historical data. Since, during every trading day, DJN/R stores the most recent quotes in a different database from that containing historical information, you have to make an entirely separate log-on/data-fetch operation to get the latest trading data.

Analyzer compounds the problem by making you use a separate, "temporary" data disk just to collect current quotes and tack them onto your historical data. You shuffle disks, twiddle your thumbs, and at last you're ready to use all this information you've collected. You hit the menu selection for "individual charts," and the program rolls up its sleeves and gets to work.

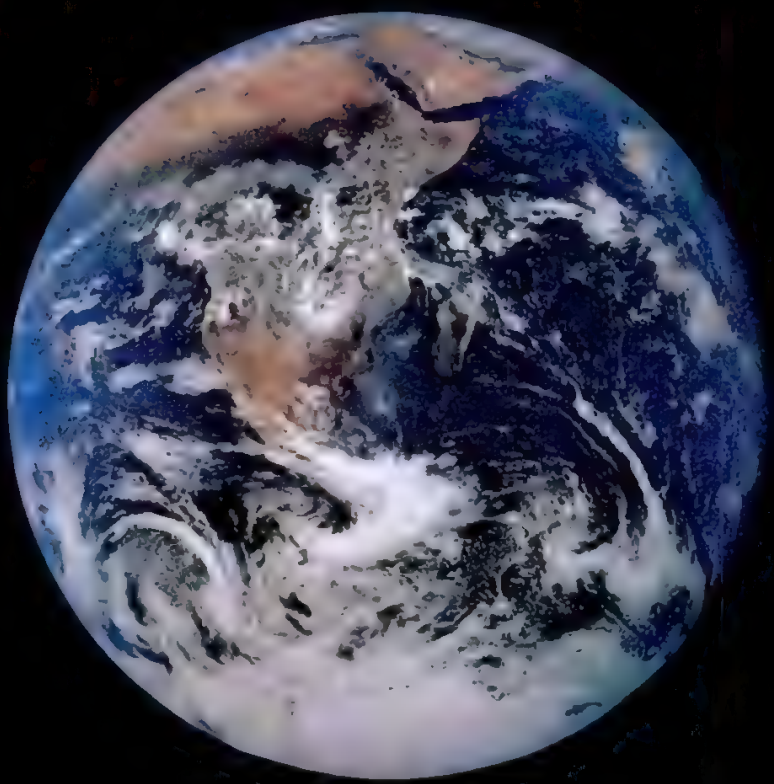
Price Charts

Figure 1 is an example of the standard chart produced by the program. The series of vertical lines in the top portion indicates high, low, and closing prices for each trading day, with dollar amounts indicated on the left-hand vertical axis. The lower portion of the chart is relative trading volume. The natural logarithm of the smallest daily volume for the period is subtracted from the logarithm of every other day's volume. The smallest volume (the sixth day) is thus displayed as zero. The ADV figure is the Average Daily Volume for the period and the Units Available figure indicates the total number of days for which information has been stored for the stock. In this case, I chose to graph the information for only the last 20 trading days. The symbol for the stock itself, BA, is displayed in the lower center of the chart.

ANALYZER works its wizardry with just four figures for each trading day: close, volume, high, and low.

One problem with these charts is that precise volume and even price figures are hard to read. Also, since the horizontal time axis has no units it is not always easy to tell what day the data refers to. Fortunately, if a precise reading is required, *Analyzer* allows you to print out a listing of the historical data retrieved from DJN/R. With figures in hand, you'll have no trouble reading the charts.

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CIRCLE 376 ON READER SERVICE CARD

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The standard chart can be displayed with many variations. I could have chosen to set the vertical axis to a semi-log scale to more accurately reflect percentage changes in price, or I could have shortened or lengthened the vertical or horizontal scales to display the information in whatever format I wanted. Of greatest interest, though, are the mathematical transformations that can be worked on the data.

Figure 2 shows the same data for Boeing Aircraft stock, but the time period has been expanded to cover a period of 60 trading days. Over the simple high-low-close data I have superimposed a 10-day exponential moving average of the closes. This is the curving line that smooths out some of the fluctuations in the raw data. I could have chosen a simple rather than exponential moving average and selected any number of days over which to calculate it.

On the same chart, I have also plotted a least-squares fit of the closing prices, which gives a statistical indicator of the price trend over the period. This is the lowest of the three diagonal lines. The other two diagonal lines are 1/3 to 2/3 speed resistance lines, which are based on the same data as the price trend and indicate the range in which the stock is likely to trade should it break out of the current trend.

In the lower portion of the chart, I have plotted the price volume trend (PVT) for the period. This figure is determined by adding a percentage of each day's volume to an arbitrarily chosen value. The percentage is the percent price change for the day and is positive or negative according to the direction in which the price moved. In this instance, I have smoothed out the PVT curve by superimposing a 10-day simple moving average. In this same lower space, *Analyzer* can plot positive, negative, cumulative, and daily volume indicators, as well as volume line charts and price volume trends.

In Figure 3 I have again taken the 60-day Boeing Aircraft data and manipulated it in different ways. This time I plotted three 10-day simple moving averages of the closing price. The middle curve is based on the actual closes, while the top and bottom curves are based on the closes plus or minus 5 percent. Once again, I have indicated the general trend with a least-squares fit (that is, the diagonal

Figure 1: A standard price chart generated by Analyzer. Boeing Aircraft is the stock used in this example.

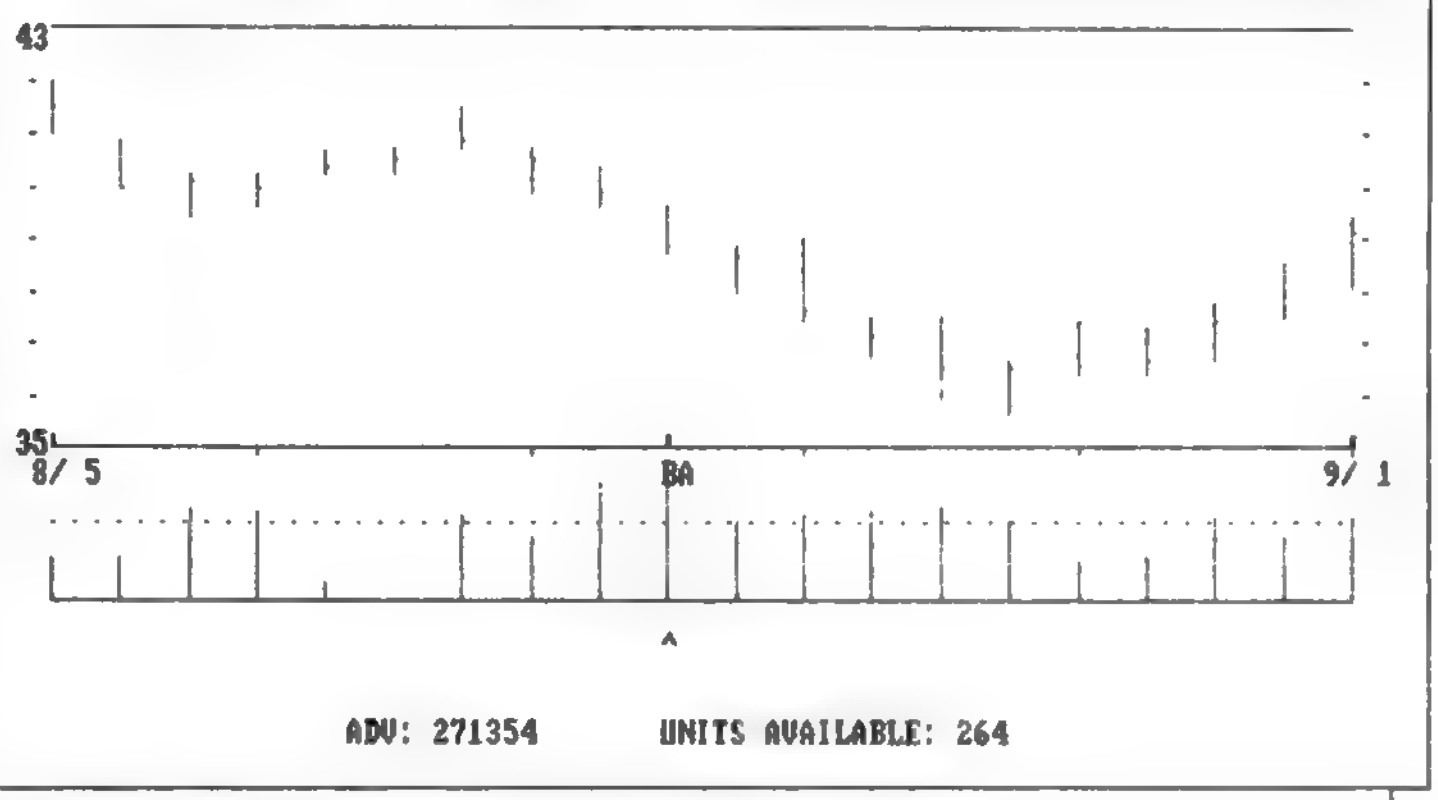


Figure 2: A graph showing data for Boeing Aircraft stock. The time period has been expanded to cover 60 days.

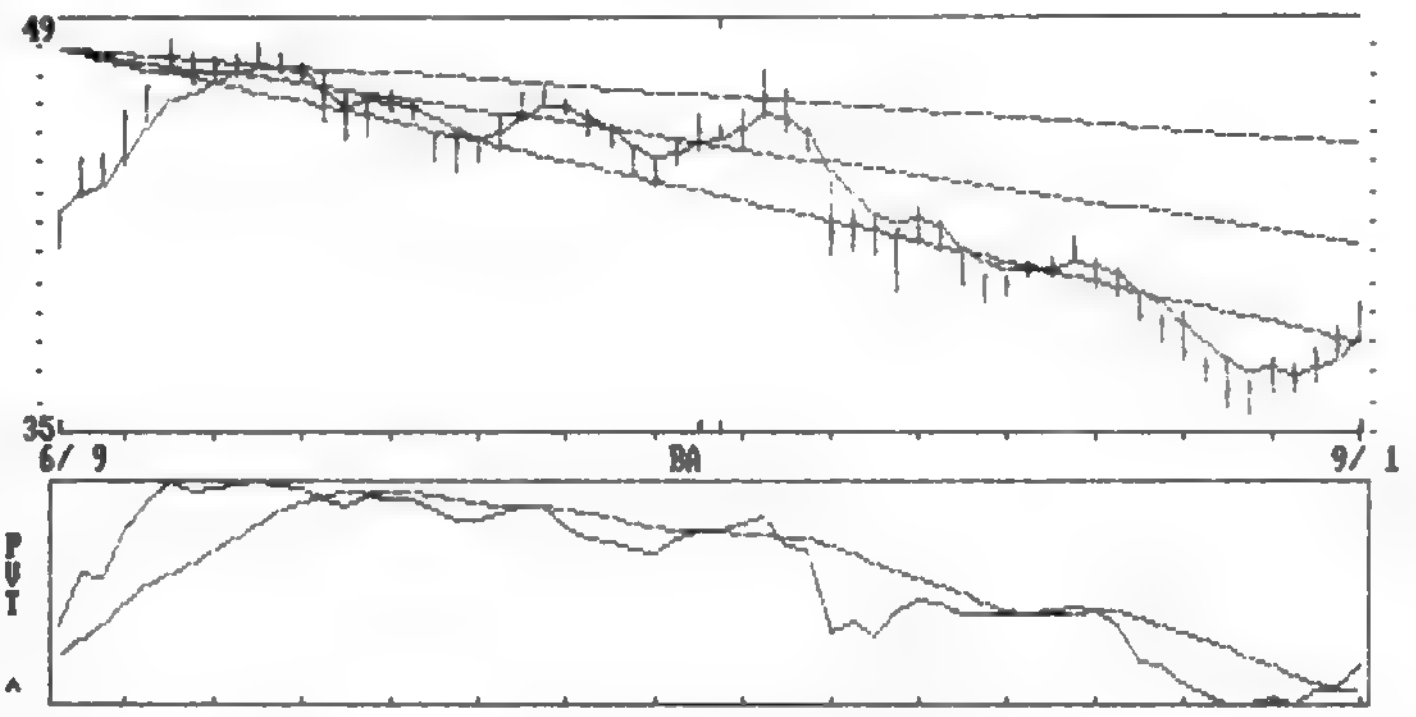
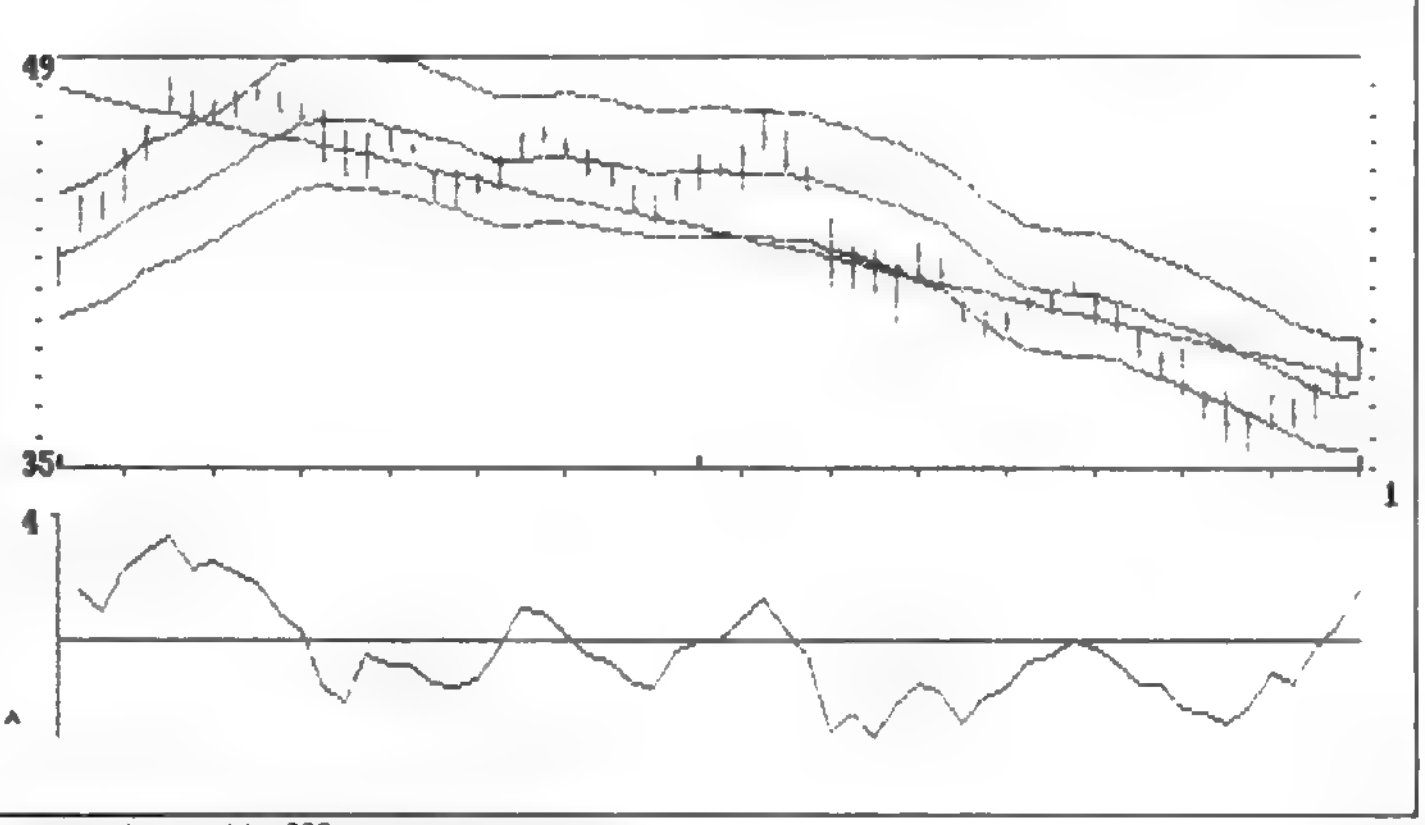


Figure 3: The 60-day Boeing Aircraft data is further manipulated. This graph gives three 10-day moving averages of the closing price.



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Figure 4: *A price performance comparison of five aerospace stocks: Boeing, McDonnell Douglas, General Dynamics, Lockheed, and Martin Marietta.*

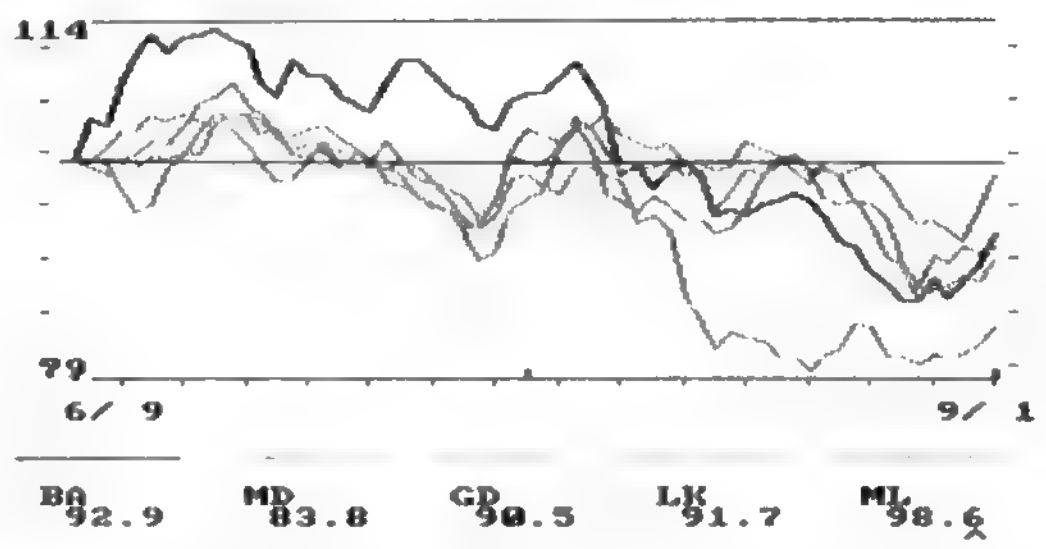
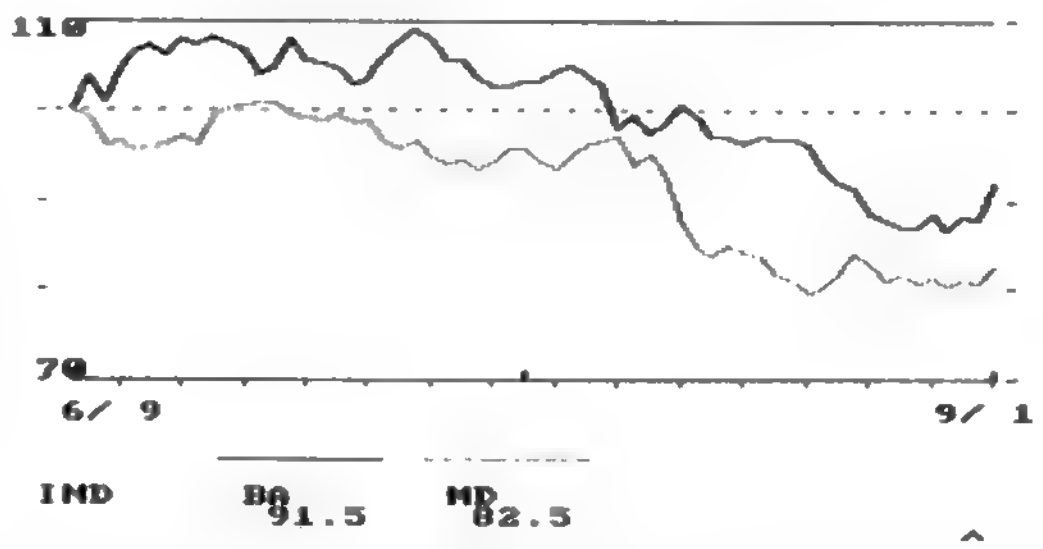


Figure 5: *In this comparison chart stocks are compared to the value of another stock or index.*



straight line) of the closing prices.

In the lower portion of the graph I have constructed an oscillator line chart that compares each close with the value for the 10-day simple moving average plotted above. Such oscillator charts can be used to compare high, low, close, or volume with any kind of simple, weighted, or exponential moving average.

What, though, are we supposed to do with all these fancy graphs? Dow Jones leaves that entirely up to you. Each technical analyst has his own tricks for associating different indicators with subsequent movements in a stock's price. If you think there may be a relationship between negative volume indicators and imminent price changes, *Analyzer* will help you hunt for it. The program doesn't even ask that the relationship make sense. As the manual points out, "The fact that a particular method works need not be explainable, however strong the urge to do so." Dow Jones is perfectly happy to help you make a buck even if you can't explain how you did it.

Comparison Charts

Analyzer has another graphing capability that is somewhat less arcane. By selecting the Comparison Charts item from the main menu you can take up to five stocks and plot their prices against each other. In Figure 4 I have compared the price performance of five aerospace stocks—Boeing, McDonnell Douglas, General Dynamics, Lockheed, and Martin Marietta—over the same 60 trading-day period as the earlier charts. The graph shows what $100 invested in each stock on June 9 would be worth at any time during the period. The numbers along the bottom (below each stock symbol) indicate what each $100-investment would have been worth at the end of the period, on September 1.

On a monochrome display or printout, this graph is difficult to follow; only the first stock, Boeing, is charted with a distinctive boldface line. Thus, when the other curves intersect, it is hard to tell which is which. The graph is easier to read on a color monitor but, curiously, *Analyzer* fails to exploit the full potential of color. For five chart lines, it uses only three different colors, and thus data can still be confusing.

A different kind of comparison chart is shown in Figure 5. Here the standard to which stocks are compared is not $100, but the value of another stock or index. In this case, I have taken the value of the Dow Jones Industrial Index as the standard and charted Boeing and McDonnell Douglas against it. Since I am comparing only two stocks whose values diverge immediately, I have no difficulty interpreting the results.

DOW JONES is perfectly happy to help you make a buck even if you can't explain how you did it.

Overall, the charts that *Analyzer* produces are handsome and readable. Many users will want to save hard copies. Unfortunately, the *Analyzer* printer interface is unnecessarily clumsy. If you have forgotten to turn on your printer before you hit the print button, all the nifty curves you have plotted are for naught. The program goes into an error mode that cannot be corrected simply by turning on the printer; you are booted right out of the graphing module and have to start all over at the main menu. It takes a good deal of time to get those plots onto the screen, and it is harsh punishment to have to reconstruct them simply because you forgot to turn your printer on.

By the same token, once the printer gets going it doesn't want to stop. It takes about 2 minutes to run off each chart; that's a long wait if you suddenly realize one of your curves wasn't quite right. Nothing short of a warm boot will make the program abort a print jot.

Analyzer has another printer deficiency. As mentioned earlier, it allows you to run off columns of historical Dow Jones information, but this is strictly an all-or-nothing affair. If you have 264 days of data on a stock, but only want to look at the last month, you have to sit and wait while your printer churns out all 264. You can *chart* any part of your data; you have to *print* all of it.

There is yet another printing feature in which the Apple version of the program gets better marks than the IBM version. With a PC, you get only one choice of chart size: a tidy 5 inch by 2 ¾ inch—about the size of a note card. With the Apple, you can print small, or, if you choose, turn a chart on its side and practically fill an 8 ½ inch by 11 inch sheet. Small may be

beautiful, but it would be nice to have a choice.

Finally, though it is not its fault, *Analyzer* can be handily used to chart data only on common stock, preferred, or warrants. Since DJN/R doesn't keep historical data on anything else, *Analyzer* can't do historical retrievals for bonds, options, mutual funds, or treasury securities. The program does offer the option of entering data by hand—this way you could do fancy statistical analysis on anything you like. Still, in spite of the time it takes to fetch data, the direct DJN/R link is a vital part of the program, and any analysis that can't take advantage of it becomes infinitely more tedious.

Analyzer is, nevertheless, a powerful program that will be of great value to traders with a technical bent. Anyone who has ever drawn a high-low-close chart by hand will immediately recognize the usefulness of a package that does the drudge work. *Analyzer* not only does the drudge work, it massages the data with a mathematical finesse far beyond the reach of anyone without a computer.

Managing Your Portfolio

Once you have gotten *Analyzer* into harness and have started making a lot of trades, you might want to use the Dow Jones *Market Manager* to keep track of your portfolio. Though certain eccentricities limit its usefulness, the program does a reasonable job of keeping track of trades in up to 26 different portfolios.

Dialing for Dollars: Talking to Dow Jones

With the Dow Jones News/Retrieval network, PC users can tap into one of the largest professional databases in the country.

The Dow Jones News/Retrieval network is probably the most widely used professional database in the country, and it has become the standard news source for serious investors. Both of the programs reviewed here allow the user to tap into it and incorporate data directly into reports and calculations.

DJN/R has dial-up and log-on procedures similar to those of other computer-accessed databases like The Source or CompuServe. Connect time, though, is a touch more expensive. Normally, Dow Jones charges a one-time password fee of $50 to each subscriber, but this fee is waived if you buy one of their programs. A special envelope containing an identification number comes with the package. A special toll-free line allows you to contact DJN/R, submit your identification number, and receive your password.

There are several different rate scales for DJN/R subscribers. For the standard customer, prime-time calls (from 6 a.m. Eastern Time to 6 p.m. local time) cost about a dollar a minute, depending on which database is called. During non-prime time, the charge drops to about half that or less—stock quotes drop from 90 cents a minute to 15 cents a minute. For an additional $75 a year, subscribers get the Blue Chip Plan, which gives them additional discounts during non-prime time. For the heaviest users, there is an Executive Plan. This increases the flat rate to $50 a month but gives the same non-prime discounts as the Blue Chip Plan, plus a 30- to 40-percent discount during prime time. All connect-time charges are at 300 baud; the rate is doubled for 1200 baud.

What do you get in return? A lot. In addition to current and historical information on more than 6,000 securities, you have access to detailed information on publicly traded companies, financial and sports news, weather reports, and movie reviews. DJN/R even has an on-line encyclopedia if you're tired of wrestling with *The Encyclopedia Britannica*. The system is menu-operated and logically laid out. Subscribers also get a DJN/R Fact Finder, which clearly explains how the system works and lists all the securities codes.

The toll-free number which you use to secure your password is also a customer support line. Occasionally it's busy and you almost always get put on hold, but the folks who answer the phone are friendly and helpful. Unfortunately, not many of them know much about Dow Jones software; you leave your name and number and one of the few experts will eventually call you back.

Both *Market Manager* and *Market Analyzer* are designed to go straight to the specific databases that contain the information they require and then log off immediately when the data has been retrieved. Their communications modules, however, are quite different. *Manager* will work only with the Hayes Smartmodem or Smartmodem B and only at 300 baud, a fact that the manual passes over in embarrassed silence. The program will, as if in compensation, auto-dial stored telephone numbers. *Analyzer* will work with any RS232-compatible modem and will whiz along at 1200 baud, but you must dial from the keyboard. Telephone numbers, just like stock lists, must be perfect each time; *Analyzer* will not let you go back and make corrections. If you make a typo, you have to start the dialing process all over again.

If you want to browse through information not specifically required by the program you are running, you can select EZ terminal mode from the communications menu. In this mode, you can explore the entire DJN/R network and stay logged on for as long as you can afford it.

DJN/R provides a valuable service; it's easy to see why Dow Jones decided to design software around it. However, their programmers aren't yet up to the standards of their journalists. When Dow Jones software gets as good as Dow Jones news, the combination could be unbeatable.

—*J.T.*



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After a simple setup routine, you are ready to start entering the data for transactions in stocks, bonds, options, mutual funds, or treasuries. The program lets you record buy, sell, short-sell, and buy-to-cover orders; it also keeps track of the cash account. Aside from dialing up DJN/R for current quotes, the cash or securities entries that you make are the only data the program needs. *Manager* will thus track holdings by portfolio, record gains and losses, and it will keep a cumulative record of all trades.

Entering transactions is a straightforward process. A data-entry screen prompts you for the name of the portfolio (identified by a single letter), the data of the transaction, its nature (buy, sell short, etc.), the Dow Jones symbol, the type of security, and the transaction dollar amount. On successive entries, all but the quantity and amount will default to the values of the previous entry at the touch of the return key. This makes it easier to enter a series of similar trades.

Unfortunately, if you hit the enter key for the transaction amount, it will default to a value of zero; *Manager* thinks you are getting stocks for nothing or giving them away free. This is a silly and potentially dangerous defect, because you could very well be using the enter key to duplicate data from the previous entry and hit it by mistake for the transaction amount. *Manager* does no error checking on stock symbols, either. It will gladly accept a dollar amount in place of a stock symbol, even though there is no such thing as a strictly numeric symbol.

Luckily, unlike *Analyzer*, *Manager* will let you return to any line on the data-entry screen and correct errors, so long as you catch them before you move on to the next transaction. While you are in the same program module, you can delete or change earlier transactions and make entries to the cash account.

One clever feature of the program allows you to match closing transactions with any appropriate open position. For example, you may have bought the same stock on different occasions at different prices. When you decide to enter a sell transaction, the program will cycle through the portfolio and show you the various long positions you could close against. Your profits (or losses) will vary according to which position you choose to close out, and *Manager* records the appropriate results. Whenever you buy or sell, *Manager* also reduces or increases your cash account.

Generating Reports

Market Manager can generate three kinds of reports on the portfolios it is maintaining. Figure 6 is a record of all the transactions entered for a hypothetical portfolio I have identified as 'Q'. I started on July 18, 1983, with a cash injection of $8,157 to buy 150 shares of Martin Marietta (ML), and then went on to play with several other aerospace stocks.

Though this report does indicate all the activity in the account, it does some things in strange and awkward ways. Note, for example, that neither a "delete" operation (sixth transaction) nor a "change" operation (next-to-last transaction) actually deletes or changes an earlier entry. The deletion in this case applies to the transaction immediately preceding it, but if several transactions had intervened, it would be hard to tell which trade had actually been deleted.

THE PROGRAM lets you record buy, sell, short-sell, and buy-to-cover orders; it also keeps track of the cash account.

The "change" transaction is, if anything, even more ambiguous. From the report one might guess that I had tried to change the price of an earlier transaction involving a trade of 100 LK (Lockheed). In fact, once again the "change" applies to the immediately preceding transaction and indicates that I decided to sell short only 100 LK rather than 200.

It could be argued that by leaving the original transactions unchanged, the program's "deletions" and "changes" provide a more complete, if confusing, record of everything that happened in the account—including mistakes. Even so, the user should have the option of actually removing inappropriate entries; any he chooses to keep in the records should be clearly identified, perhaps with an asterisk, to show that they have been modified.

Note also that the report does not sort transactions by date; it prints out each one precisely in the order in which it was entered, no matter what date was specified for that transaction. For example, the purchase of General Dynamics (last transaction) is not listed in chronological order because the entry was not made until after the fact. This would not be too great a problem if the program were being used every day for real trades; it is unlikely that

Figure 6: A record of all the transactions entered in the hypothetical portfolio Q.

YEAR-TO-DATE TRANSACTIONS

TODAYS DATE 09/06/83

DATE	CODE	TRANSACTION	DESCRIPTION			AMOUNT
7/18/83	Q	CASH	BUY M. MARIETTA			8157
7/18/83	Q	BUY	150 ML	@	54.50	8175
7/19/83	Q	CASH	BUY M. MARIETTA			5500
7/19/83	Q	BUY	100 ML	@	55.00	5500
7/26/83	Q	SHORT SELL	100 LK	@	63.00	6300
9/06/83	Q	DELETE	100 LK	@	63.00	6300
7/26/83	Q	SHORT SELL	100 LK	@	123.25	12325
7/28/83	Q	SELL	100 ML	@	63.00	6300
8/23/83	Q	BUY/COVER	100 LK	@	112.25	11225
9/04/83	Q	SHORT SELL	200 LK	@	112.38	22476
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8/04/83	Q	BUY	200 GD	@	53.25	10650

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*GraphPlan is the only integrated spreadsheet/graphics program currently available for these machines. †Soon to be released

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buy/sell records would be entered in anything but chronological order. Still, entries that were made to patch up past errors would always appear in the wrong order.

A second *Market Manager* report records realized gains and losses by portfolio. Figure 7 gives the results for portfolio 'Q'. The proceeds are correctly recorded and are broken out into long- and short-term totals. All values accurately reflect "changes" and "deletions."

The last report, Figure 8, lists the current holdings in portfolio 'Q' and shows the results of all sales and purchases. It carefully nets out sales against long positions and distinguishes nicely between long and short securities. It is also the only report that requires the latest securities prices, which can be entered either manually or via Dow Jones. Unless *Manager* were running very large portfolios, manual updating might be a realistic option. Since *Manager* can run at only 300 baud anyway, the program could conceivably be used without a DJN/R subscription.

Annoying Flaws

Though *Manager* does a few simple things well, it has several shortcomings that keep it from being the true broker's tool it could have been. For example, it would be useful if *Manager* could automatically factor a commission into every transaction price. As the program is now designed, it is possible to manually adjust each transaction to account for commissions, but why not let the user specify commission rates and let the program do the math?

Another disappointment is *Manager*'s inability to handle margin transactions. It would be enormously useful to a broker to be alerted by his software whenever he needed to make a margin call. Also, if the program allowed him to input periodic changes in the loan rate, it could figure margin interest charges as well.

Even as it now stands, the program could have been designed more efficiently. Delays of 15 to 20 seconds are not unusual as the program grinds its way from one module to another; the longest wait is about 40 seconds. The fact that the program can't tell the difference between single- and multiple-key input is an added annoyance. *Analyzer* responds immediately after a prompt for a single-digit or single-letter response, but *Manager* loafs around until you hit 'return'—even after a Y/N prompt.

Finally, though the manual is generally adequate in most respects, its explanation of the setup routine contains a serious flaw. In a couple of instances, what appears on the screen is completely different from what you are told to expect. Though this is not a problem for anyone who is familiar with computers (all you have to do is follow the prompts on the screen) it can be a real shock to beginners.

Market Analyzer and *Market Manager* are designed for entirely different purposes, and each has its own personality. It is no surprise, therefore, to find that despite their identical gray packaging, they were written by different people—Dow Jones farmed each package out to separate software houses. The general menu-driven approach is thus the same, but the coding is entirely different. *Analyzer*, for example, is written in straight, unprotected BASICA, and adept programmers could easily customize the package for their own needs.

Manager, on the other hand, is a p-System program. You can't even do a directory of the disk, much less list the code. It is also copy-protected; the manual warns that any attempt to copy the original will disable it.

What, then, are we to make of these offerings from Dow Jones? Though one would expect only the slickest programming to get the DJ imprint, these packages still have rough edges that need to be smoothed in subsequent releases. In effect, both programs are nothing more than expensive, specialized databases with stock market information for input. Databases now come in all degrees of elegance and sophistication; these do their jobs, but they don't always make it easy for the user to do his. */PC*

Figure 7: Market Manager generates the results of portfolio Q.

REALIZED GAINS/LOSSES

TODAY'S DATE 09/06/83

CODE	SYMBOL	PURCHASE QTY	PURCHASE DATE	PURCHASE PRICE	PURCHASE $COST	SALE DATE	SALE PRICE	SALE PROCEEDS	GAIN/LOSS	L/S
Q	ML	100	7/18/83	54.50	5450	7/20/83	63.00	6300	850	S
Q	LK	100	8/23/83	112.25	11225	7/26/83	123.25	12325	1100	S
TOTALS:										
	LONG	0			0			0	0	
	SHORT	200			18675			18625	1950	

Figure 8: A list of current holdings in portfolio Q showing the results of all sales and purchases.

HOLDINGS BY PORTFOLIO

TODAY'S DATE 09/06/83

CODE	SYMBOL	TYPE	B/S	DATE	TRANSACTION QUANT	TRANSACTION $COST	TRANSACTION PRICE	09/06/83 $VALUE	09/06/83 PRICE	UNREALIZD GAIN/LOSS	L/S
Q	GD	S	B	8/04/83	200	10,650	53.25	10,550	52.75	-100	S
Q	LK	S	SS	9/04/83	100	11,238	112.38	11,488	114.88	-250	S
Q	ML	S	B	7/19/83	100	5,500	55.00	6,233	62.33	733	S
Q	ML	S	B	7/18/83	50	2,725	54.50	3,117	62.33	392	S
*TOTAL ML					150	8,225		9,350		1,125	
VALUED SECURITIES LONG					350	18,875		19,900		1,025	
VALUED SECURITIES SHORT					100	11,238		11,488		-250	
CASH BALANCE = 7970											

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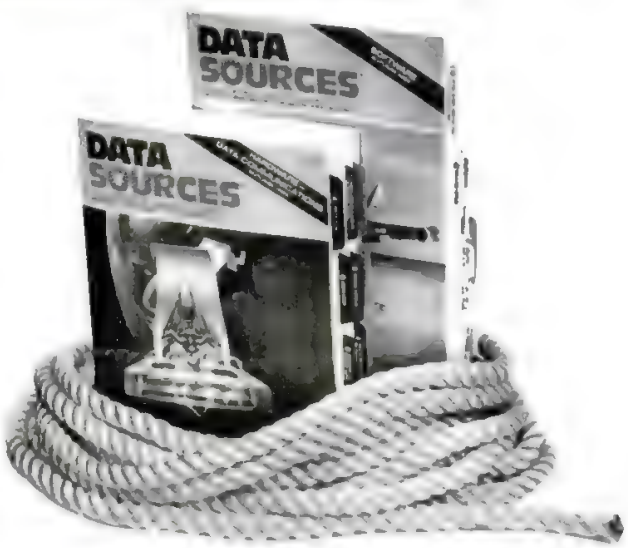
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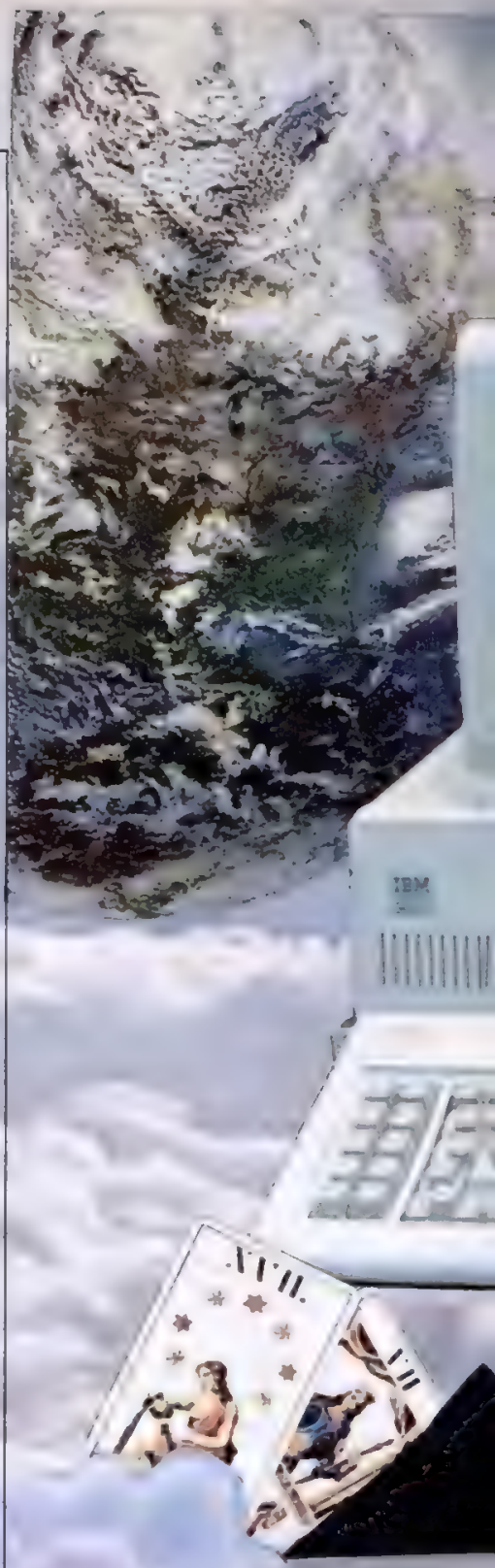
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I was a fly on the wall at one of those exclusive, expensive, specialized microcomputer market research seminars. The purpose of the all-day session: to display to industry insiders the results of the latest tea leaf and Tarot card readings of a major professional fortune-telling company.

I learned a number of interesting things about the IBM PC and PC-compatible marketplace and the general state of the microcomputer industry. But first, my principal finding: The crystal ball gazing and consulting sector is having a boom year.

Actually, I can't really claim to have been a spy since I was invited by Future Computing, Inc. (900 Canyon Creek Center, Richardson, Texas 75080) to its "IBM PC Market and PC Technology Day" at the Mark Hopkins Hotel in San Francisco. And I can't really say that I had to hide myself from the notice of the other participants, since it turned out that the session was hardly that exclusive. This one-day meeting, one of five days of differing presentations by Future Computing scheduled over a week's time, nearly filled a large conference room at the Mark Hopkins Hotel. I counted perhaps 200 interested listeners—at $500 a head. The line on the name tags reserved for the affiliation of the attendees included such American competitors of IBM as Apple, Hewlett-Packard, Texas Instruments, Fortune, Eagle, Corona, Lear-Siegler, AT&T, Franklin, and others. Japanese companies—NEC, Fuji, Epson, Fujitsu, Toshiba, Okidata, and others—were also out in force. And, oh yes, perhaps a dozen IBMers from various divisions and departments were there as well, doing what you'd expect representatives from any self-respecting top-of-the-heap manufacturing concern to do: taking notes.

What was Future Computing's principal message? "Jump on the IBM PC-compatible bandwagon—quickly, and as compatibly as possible." The session focused on the marketplace meaning of "IBM PC compatibility" and its importance both to IBM and to Big Blue's cooperative and competitive suppliers. The panel, and most of those present, of course, regularly bowed to the southeast in obeisance to the Boca Raton, Florida, home of the PC.

What IBM Did Right

IBM's success, according to Future Computing's Portia Isaacson, Egil Julius-

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sen, John Hemphill, and Ronnie Ward, can be credited to the company's name recognition, the right marketing plan, the right software plan, and the right hardware plan. The bottom line, Isaacson told the attendees: According to Future Computing's readings, IBM received nearly $500 million in revenues from the PC in 1982, and its PC revenues will surpass $1 billion this year as IBM becomes the largest personal computer manufacturer. Translated into units: 188,000 PCs sold in 1982; 418,000 PCs and PC-XTs sold in 1983. (IBM, of course, does not disclose any unit numbers or sales volume from its Personal Computer operations.)

According to Isaacson, Future Computing defines a marketplace *standard* as a device that is available from multiple suppliers in identical or near-identical form and that is able to use interchangeable media. The audio cassette is such a marketplace standard, as is the 33⅓ rpm phonograph record. IBM's own base of several hundred thousand units, combined with the thousands of compatible units pouring out the factory gates of its competitors, has therefore made its design into an instant classic.

Where does IBM go from here? According to Future Computing, IBM's share of the personal computer business market will stay at about 50 percent for the next 5 years, with sales of 622,000 machines in 1984, 808,000 in 1985, 1.1 million in 1986, and nearly 1.7 million floppy- and hard-disk-based business machine sales by 1988. These projections included sales of a portable IBM PC, whose introduction to the market was forecast for 1984.

Future Computing also predicted several new devices that will be made available for sale by IBM in coming years: a *productivity home computer*, whose takeoff in sales, it was estimated, would begin in 1984 (245,000 units next year, 399,000 in 1985, and 548,000 in 1986, reaching 889,000 units by 1988); an *entertainment home computer*, due in small quantities in 1984 and beginning its sales spurt the next year (599,000 units by 1988); and *novelty home computers*, scheduled to arrive around 1985 and expected to sell at a rate of 158,000 units a year by 1988.

Much of the credit for the IBM phenomenon was attributed to the generally skillfull handling of the software side of the business. Software support can make or break a hardware product, a lesson that has been learned by a number of computer makers in recent years.

The fact that the IBM machine was introduced with a small but competent base of software, that IBM worked with outside suppliers for the first time to make it easy for them to come up with programs of their own, and that the PC-DOS/MS-DOS principal operating system was close enough to CP/M 2.2 calls to allow reasonably quick and easy translation of existing programs, all contributed to the success story, Isaacson said.

The "open" (nonproprietary and nonsecret) architecture of the IBM PC has attracted support from more than 150 third-party companies, and the result has been the de facto acceptance of a software and hardware standard built around IBM's product line, the panel declared.

Why has this been a good strategy for IBM? "Does IBM want stores, third parties, and software companies working *for* them or *against* them?" Isaacson asked.

How Big a Market?

More numbers from Future Computing's crystal ball: The market share of PC-compatible hardware ("data compatible" and above, to be defined shortly) is already at 48 percent of personal computer sales, or $6 billion in 1983. By 1988, PC-compatible machines will have captured 59 percent of the personal computer market, grossing $23.7 billion.

Although the business and office segment of the microcomputer market has obviously been the hot area in the past year in terms of dollar volume, the coming home-computing revolution will certainly represent a larger market in terms of volume of units to be sold. IBM received credit from Future Computing for positioning itself, along with the Apple IIe, the new models of the TRS-80, and the Franklin Ace (an Apple-compatible), as a candidate for the office *and* home markets. Thus far, Hewlett-Packard, Digital Equipment Corp., TeleVideo, Victor, Zenith, and Altos are staked out solely in the office market, whereas Atari, Commodore, Texas Instruments, and Timex-Sinclair have limited themselves to the low-end home market, according to Future Computing's analysis.

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But Are They Compatible?

On the minds of most of the attendees at the session was another question: "How does my company fit in?" And the answer Isaacson and the rest of the Future Computing panel came back with was: "Be compatible." During the early months after the introduction of the IBM PC, there were two scrambles underway, according to Future Computing. One was among manufacturers who took the point of view that faster and improved and bigger were all better; the other was among manufacturers that believed imitation, with improvements, was sincere flattery and good business sense.

Again, according to Future Computing, the sales success of the IBM PC has made successes of the companies that sought compatibility, like Compaq, Columbia, and Corona, and has endangered the reputations and future viability of companies that went the other route, like Texas Instruments, Victor, and DEC.

Why should a customer buy an IBM-equivalent machine from a different company? For styling, for price, for greater value (including bundled software), for greater functionality, for differing service options, or because the IBM product is not available.

These considerations, therefore, should be exactly those looked at by a manufacturer developing a strategy to differentiate itself from IBM while still maintaining a link as a compatible. As for packaging, compatibles have included free software and various IBM options as standard features, such as parallel and serial ports, modems, display adapters, and other items. They have been made smaller and lighter for sale as portables and have been offered at lower prices. In terms of hardware, compatibles offer many other improvements on the PC original—a different keyboard layout or keyboard feel, higher resolution graphics, a reset button, more character attributes, and so forth.

The Electronic Grail

Ah, but what is this thing called compatibility? No machine other than one manufactured by or for IBM can truly be said to be 100 percent IBM PC since the ROM chips on the system board are proprietary and not available to other companies. The basic microprocessor "brain" of the PC—the Intel 8088—is available to other manufacturers, as are the other principal pieces of hardware, including the floppy disk controller, the color and monochrome display controllers, memory chips, and similar devices. To be hardware compatible, then, the machine must work with these parts or their equivalents and must have an equivalent microprocessor clock rate, pin connections, memory display map, and disk format. As far as software compatibility is concerned, MS-DOS (the near-identical twin of PC-DOS) is available to manufacturers by license from MicroSoft. A version of BASICA, called GWBASIC, is also available.

Future Computing has come up with four categories of compatible equipment: operationally compatible (nearly copy-cat equipment), functionally compatible, data compatible, and MS-DOS compatible.

An "operationally compatible" device is defined as one that uses the 8088 microprocessor, runs the most important IBM PC-labeled software, uses IBM plug-in boards and devices, can read and write IBM-formatted disks, and has the same commands and instructions for keyboards, displays, sound, graphics, and other operations. Within that group, Future Computing identifies the Compaq portable as closest to the mark, with the Columbia MPC and the Corona PC just slightly behind. Further off the mark but still operationally compatible, according to the panel, are the Bytec Hyperion and the Seequa Chameleon, and farthest out is the Eagle PC.

The next step down the ladder are devices identified as functionally compatible. These machines might have the 8088 or the 8086 or even another microprocessor that can be adapted to the purposes of IBM compatibility. They run their own versions of top IBM programs and cannot use cards and devices manufactured to plug into the IBM PC. They can read and write IBM PC disks, but might require different commands and instructions from the user. And finally, this class of machine cannot be upgraded to be operationally compatible. Future Computing includes the Texas Instruments Professional and the forthcoming Data General Model 10 in this class.

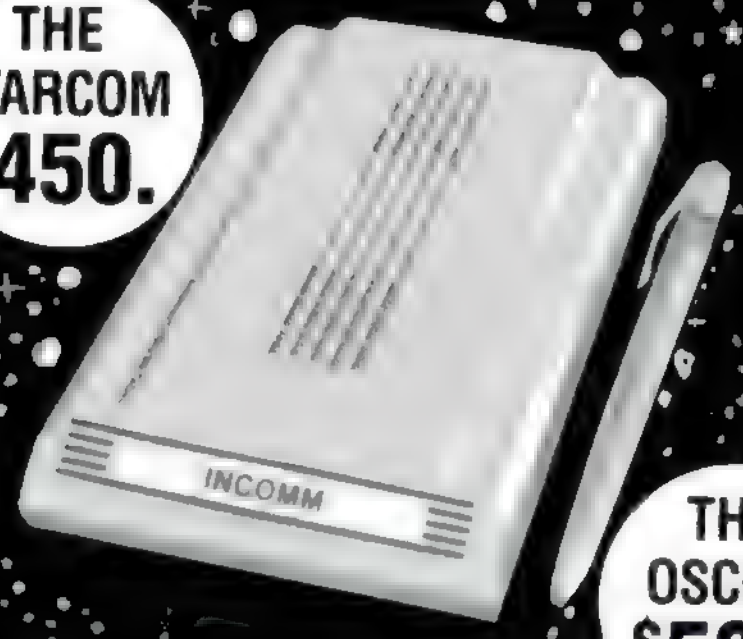
Data-compatible machines will have an 8088, 8086, or other microprocessor

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but might not run all or any of the top IBM programs. They cannot use IBM cards and devices and have a different set of user instructions and commands. Their most important feature is their ability to read from and/or write on IBM PC disks. Such a machine might be used as a secondary machine backing up an IBM. Future Computing included in this group the Eagle 1600, Grid Compass, Hitachi PC, MAD-1, NCR Decision Mate, Olivetti M20 (adapted), Pronto Series 16, Wang PC, and Zenith Z-100.

And then, finally, are MS-DOS-compatible devices. These machines are compatible in that they share the family operating system, but cannot read or write IBM disks and most likely cannot run programs aimed at the IBM market without special adaptation. Future Computing says it assumes that many such machines could be adapted in some way to become data compatible. Included in this large group are: Altos 586, Computer Devices DOT, DEC Rainbow 100, Durango Poppy PBS, Gavilan, Hitachi MBE 16000, Honeywell 6/10 with 8086 option, NABU 1600, NEC-APC, ONYX 2000, Seattle Computer Gazelle, SKS Personal Computer, Sumicom 330, Televideo TS 1602/3, Vector 4, and, finally, the Victor 9000.

Other Peoples' Businesses

Almost all of the players in the PC and PC-compatible markets are privately held or do not disclose figures on sales by unit or volume. And so, another useful feature of the Future Computing seminar was the opportunity to hear some educated guesses about other peoples' businesses.

Given here in alphabetical order are a few highlights from the analysis of several companies:

- *Bytec Hyperion*: Revenues of this Canadian company in 1983 were $50 to $65 million on sales of 15,000 to 20,000 units. The company has arranged for a U.S. manufacturing plant, and also provides a model as OEM to resellers (including Anderson-Jacobsen). Bytec Hyperion is targeting the office productivity market.
- *Columbia Data*: Revenues in 1983 were $45 to $55 million (up from $9 to $10 million in 1982) on sales of 15,000 to 20,000 units in 1983. The company plans to offer its highly compatible system board as an OEM product to other manufacturers. It has a new, large manufacturing plant in Puerto Rico and uses the Bell and Howell Service Company. The company targets the business operation market.
- *Compaq*: Revenues in 1983 were $75 to $80 million. The company is now shipping 2,000 to 3,000 units a month, netting out at 30,000 to 40,000 in 1983. It targets the office productivity market with its portable product.
- *Computer Devices, Inc.*: Revenues from the DOT portable in 1983 were $6 to $9 million on shipments of 2,000 to 3,000 units. The unit has a built-in thermal printer option.
- *Corona Data Systems*: Revenues in 1983 were $20 to $30 million on sales of 15,000 to 20,000 units this year. It uses the Xerox service organization and service centers and is targeting the business market. The company was founded in 1981 as an add-on disk manufacturer.
- *Eagle Computer*: Revenues in 1983 were $50 million on sales of 8,000 to 10,000 units each of the Eagle PC and Eagle IIE, plus 6,000 to 10,000 units of the Eagle 1600. The company went public in 1983; it uses the Bell and Howell Service organization. It targets the business operation market.
- *Seequa Computer Corp.*: Revenues in 1983 were $15 to $20 million on shipments of 10,000 to 15,000 units. It targets the office productivity market.
- *Texas Instruments, Inc.*: TTI earned an estimated $70 million from TI Professional for 1983, selling 20,000 to 25,000 units.

Whither Goest IBM?

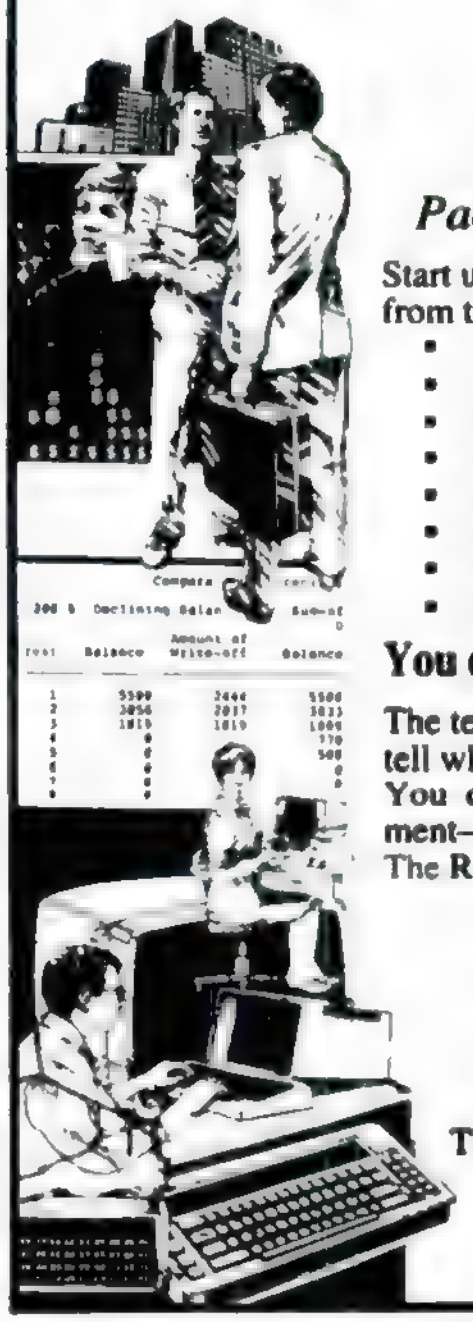
Obviously, anything and everything in the IBM tag-along market could change drastically with any major change from IBM itself. The experts outlined a set of scenarios for the evolution of the PC.

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In a compatible evolution of the IBM PC, future enhancements might include the following:

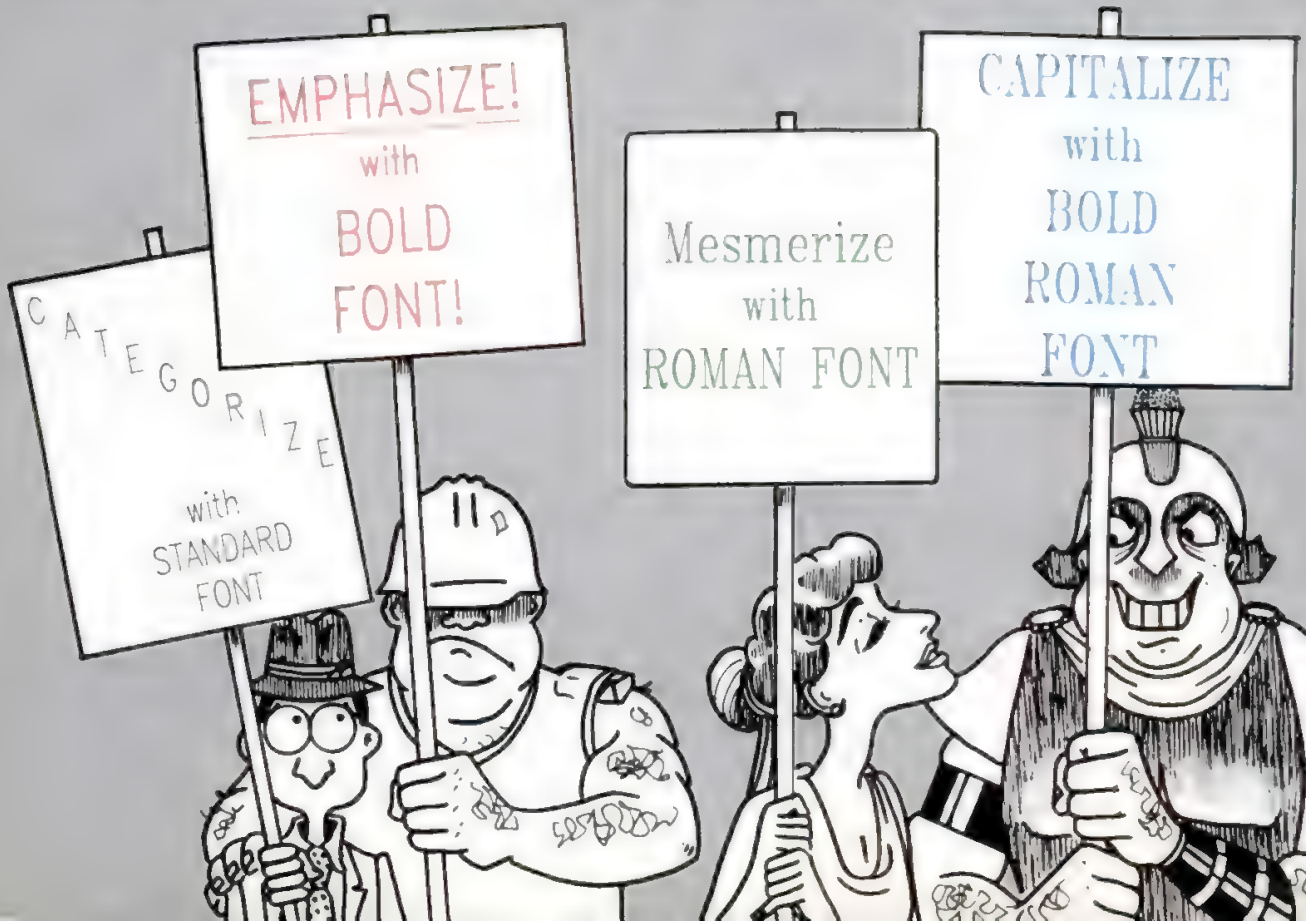
- 256K RAM chips, to reduce cost and board size;
- 212A modem chips, to allow integration of 1200 baud modems onto system boards at low cost;
- Quarter-inch tape backup systems for hard disk PC units;
- Network interface chips for local area networks;
- Advanced packaging of chips, including VLSI (very large-scale integration) units to allow smaller packages at lower cost;
- Flat panel displays, to reduce size and weight, particularly in portables;
- New disk formats, perhaps quad density floppies or hard disks.

An IBM-incompatible evolution might occur for a variety of reasons, including:

- Use of a different microprocessor, perhaps the Intel iAPX-286;

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● Use of 256K RAM chips in a PC with more than 640K RAM, causing address space conflict with present systems;
● Advanced graphics, incompatible with present display buffers or graphic controller chip;
● Use of a different physical design disk such as a micro floppy;
● Introduction of a multiuser operating system, which would have display buffer conflicts.

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CIRCLE 581 ON READER SERVICE CARD

There was a game going around the computer science labs at one of the major universities recently. Purported to separate the computer jocks from the computer nerds, it was called "Lose Big". With a challenging title like that, who could resist? Trouble was, while you were playing, it was using your logon ID to erase all your files. Kids will be kids, you say. Perhaps, but many of us unwittingly play the same game every day.

Every time you power up a PC-XT, or any system with a hard disk, you are putting everything in the machine on the line, inviting disaster. It takes surprisingly little—a hiccup on the AC lines during a directory write, a bug in a program under development, an unknowing employee playing with a disk edit or debugging program—to "lose big" on the XT. That's okay, you say. Just reformat a crashed hard disk and reload it from the backup.

Come off it. When's the last time you did a full backup on your hard disk? What has changed since then? How long would it take for you to recapture those changes? At what cost? For that matter, why haven't you backed up? It's not too difficult—just sit there with a couple of boxes of floppies and keep on shoving them in as the backup program requests them. Don't bother backing up your copy of *WordStar*; you've got the MicroPro diskette tucked safely away. Never mind that it will take you an hour to reinstall all the patches and get it back the way you like it. And so on.

I'm not saying that hard disks are unreliable. On the contrary, they're amazingly good. But that's not good enough. It's as inevitable as death and taxes: You will experience a disk crash sooner or later. The question is how well you will be able to recover from it. You can improve your chances with one of Tallgrass Technolo-

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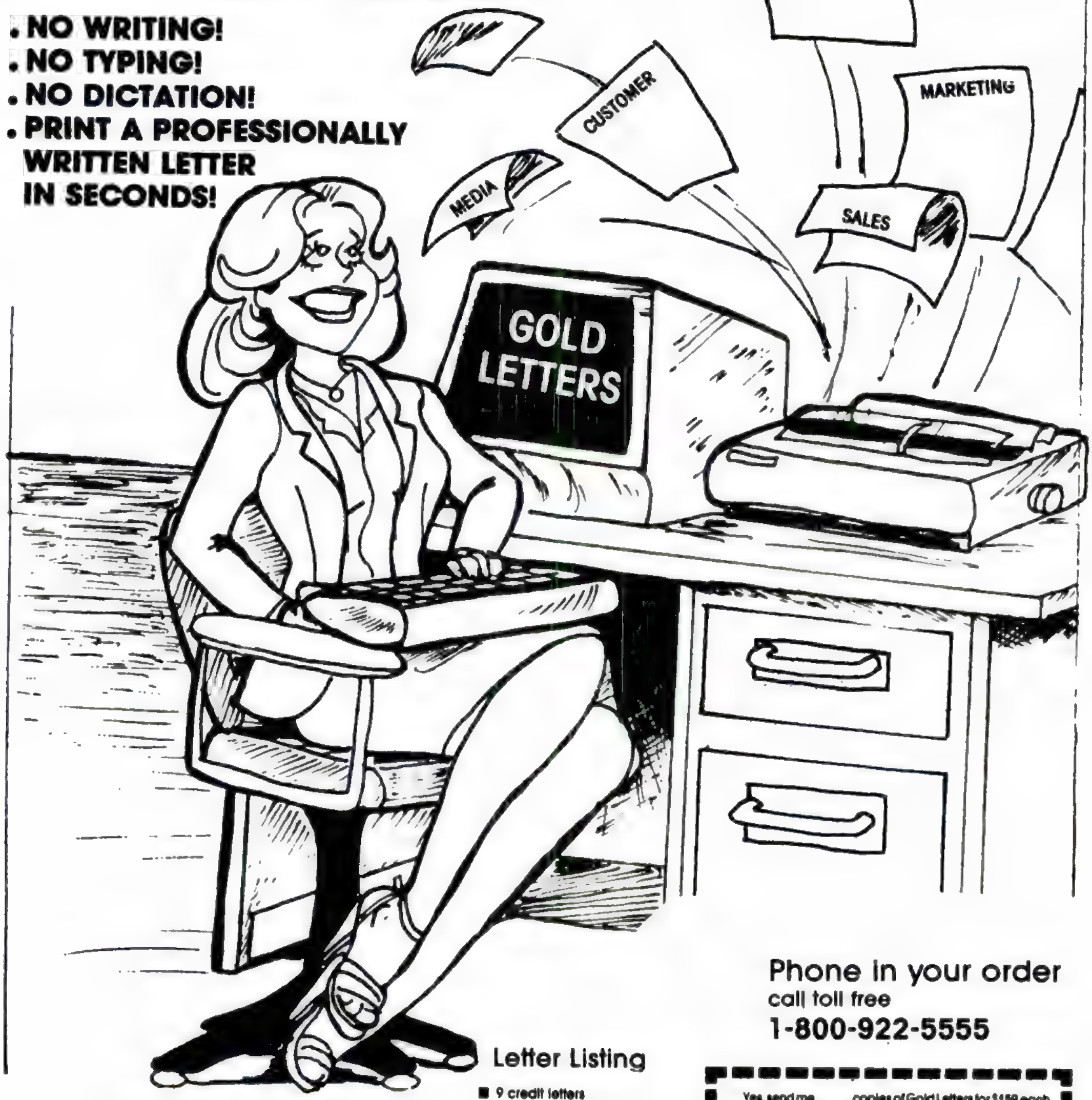
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gies' hard disks with integral tape backup systems.

Why tape? Because a cartridge can hold 12 to 45 megabytes and can get your precious data loaded and unloaded darn fast, with a minimum of intervention. Why Tallgrass? Because its approach reflects the maturity that professional PC users are looking for. Beyond the sheer "gee-whiz" capacity of these drives is a fully integrated tape backup system. The 20-, 35-, and 70-megabyte storage systems are likely to be all you'll ever need.

Tallgrass' Track Record

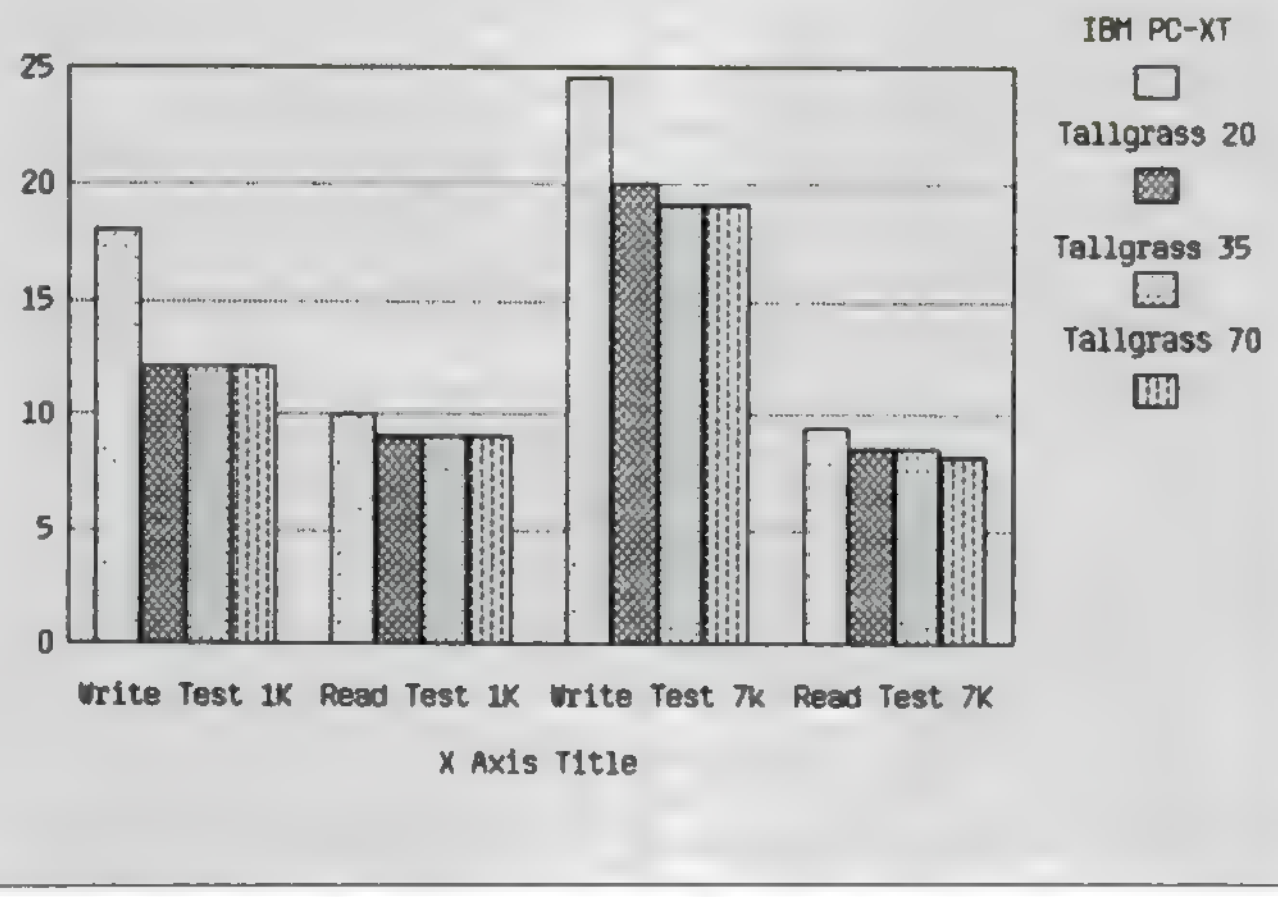
Since its inception in 1981, Tallgrass Technologies has been a leader in add-on hard disks for the IBM PC. Its current line-up includes drives from 6 to 70 megabytes, and I tested the 20, 35, and 70 megabyte versions. The attractively styled Tallgrass units are a nice accompaniment to your PC. They come with driver software for any of the environments you are likely to use: DOS 1.1, DOS 2.0, and CP/M-86. The documentation is clear and well-prepared. Now that you know the aesthetic appeal of these units, here's how they perform.

Let's get right down to the numbers. These things are fast. A PC-XT is no slouch, with its excellent disk controller and middling-fast hard disk. Bettering it by any margin should be considered an achievement. I had some read test and write test programs kicking around, left-overs from our test of network systems in the November issue (see "Battle of The Network Stars, PC, Volume 2 Number 6).

THE interface board is small enough to fit behind the floppy on a PC-XT.

They allowed me to create and then access files in BASIC's random access mode of any record size and any number of records, timing execution all the while. As a kind of baseline task, I had the program repeatedly write, then read, a file of records 1K long. The standard PC-XT executes the write test in 18 seconds. The Tallgrass units do it in 12 seconds. A second test only reads the file of 1K records. The XT can do it in 10 seconds, while the Tallgrass machines do it in 9. When I increased the size of the records to 7K, the differences became more noticeable (see Figure 1).

Figure 1: This chart shows how the Tallgrass units measure up to the PC-XT in two read tests and two write tests.



One of the things to look for in a hard disk is the ability to load commonly used programs quickly. I used good old *WordStar* for this test; it is not only a commonly used program, but also *de facto* standard in measuring load times of programs from disk. As you can see from Figure 2, there is a measurable difference between the PC-XT and the Tallgrass units, but little difference among different Tallgrass models. The 70 megabyte unit gets the nod by a slight margin, as it does in a few of the other tests. See Figure 3 for a cost per megabyte comparison.

Installing these units is simple. The interface board is small enough to fit behind the floppy on a PC-XT and requires no configuration switches or other adjustments. All of Tallgrass' units use the same controller board. On a PC-XT, one thing you have to look out for is which slot to use. The XT system board has eight slots and the eighth, where the serial card usually resides, will not work properly. It requires the board to produce a sort of acknowledge signal when it is addressed. However, the serial card usually stays there and slot seven will probably be available. More important is compatibility with other boards in the system, as I found out and as you will see.

The software controlling the installation process is straightforward. The manual gives explicit directions on creating a boot disk that will bring your system up with the Tallgrass drive on line. Tallgrass provides a Basic Input-Output System (BIOS) that is used instead of the standard IBMBIOS file on the floppy disk. The loader program is better than most software of this type; it is well-written enough to recognize problems and to default to the standard IBM version of the operating system if something is wrong with either the hardware or the software.

YOU HAD to have been here to experience the euphoria of having 80 megabytes on line in your PC!

You do not have an option of booting directly from the Tallgrass disk in a normal PC, but you can boot the Tallgrass system from the hard disk on an XT. The folks

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The 35 megabyte version of Tallgrass Technologies' Cartridge Tape/HardFile System.

at Tallgrass thought I was a little strange using their hard disk in conjunction with an XT, but you had to have been here to experience the euphoria of having 80 megabytes on line in the PC! You can have every conceivable utility and application program on board without using up even 10 megs. You can create database files up to the MS-DOS limit of 32 megabytes per file and maybe fit two of them on the 70 megabyte unit. That's euphoria.

Card Conflicts

The controller uses interrupt line 5, which is normally shared with COM2:, if present. Many multifunction cards have a serial device assigned to COM2:. If COM2: and the controller are both present in the system, it can cause intermittent write errors on the tape and may interfere with operation of the hard disk as well.

As an experiment, I backed up the hard disk on my PC-XT with the Tallgrass tape unit. The XT had a shade over 6 megabytes of files on the disk. The backup, including read-after-write verification, took 5½ minutes. When I attempted to restore its contents from the Tallgrass tape unit, the tape utility software reported four unrecoverable read errors. These errors were caused by the presence of a COM2: port in my XT. When I pulled out the offending board, the system operated flawlessly.

Figure 2: WordStar is used to measure relative loading times for the XT and the three Tallgrass units.

	WordStar Load Time
PC XT	0.9
Tallgrass 20	0.7
Tallgrass 35	0.7
Tallgrass 70	0.6

Although the interface board is configured for operation with interrupt 3, it can be reconfigured for any between 3 and 7 if they do not conflict with interrupt signals already in use. The manual gives explicit instructions for removing the write-protect tab on your master diskette and using Debug to patch the Tallgrass BIOS program for an interrupt other than 3. Although the instructions are clear enough, the system could have provided a program to do the patch for you, thus alleviating the knee-jerk distress that some people experience when you mention patching programs: "Use Debug? Me? I'm no assembly language programmer!"

The instructions for actual installation of the interface board are reasonably explicit. They assume that you will be able to get the cover off and wield the appropriate nut drivers or screwdrivers to get the card in place. They (rightly) warn you against lengthening the parallel cable that connects the interface card to the drive unit. Parallel cables are notoriously susceptible to electrical noise and they radiate a fair amount of radio-frequency noise. A short run, as with the 3 feet that Tallgrass provides, presents no problem with errors but may be a source of radio-frequency interference. You may have to shield the cable if it becomes a problem during your installation.

Powering Up

By this point, you should have read far enough in the manual to have been cautioned that the system will make a "soft ratcheting sound" upon powerup. Otherwise you will certainly think that the hard disk is digesting itself. "Pronounced clattering sound" would more accurately describe it. But never fear; it's only part of the tape drive's startup routine.

THE software setup routines allow you to divide the hard disk into as many logical drives as you like.

The software setup routines allow you to divide the hard disk into as many logical drives as you like, up to one per disk surface. A nice adjunct to this feature is that you don't have to change any switches on the system board. The Tallgrass software simply adds its drives at the end of whatever drives you've defined on the switches. You can combine drive surfaces into logical drives, up to MS-DOS' limit of 32 megabytes.

At the same time, you are presented with a number of options that you can select on a drive-by-drive basis, including read-after-write verification, memory cache, duplicate directory, and landing zone. The options have some interesting implications. Read-after-write verification, as its name suggests, ensures that the information that was written onto the disk is the same as that sent from the controller. It takes up to 50 percent longer to do a read and compare. If you have really critical data, though, you might want to avail yourself of the option.

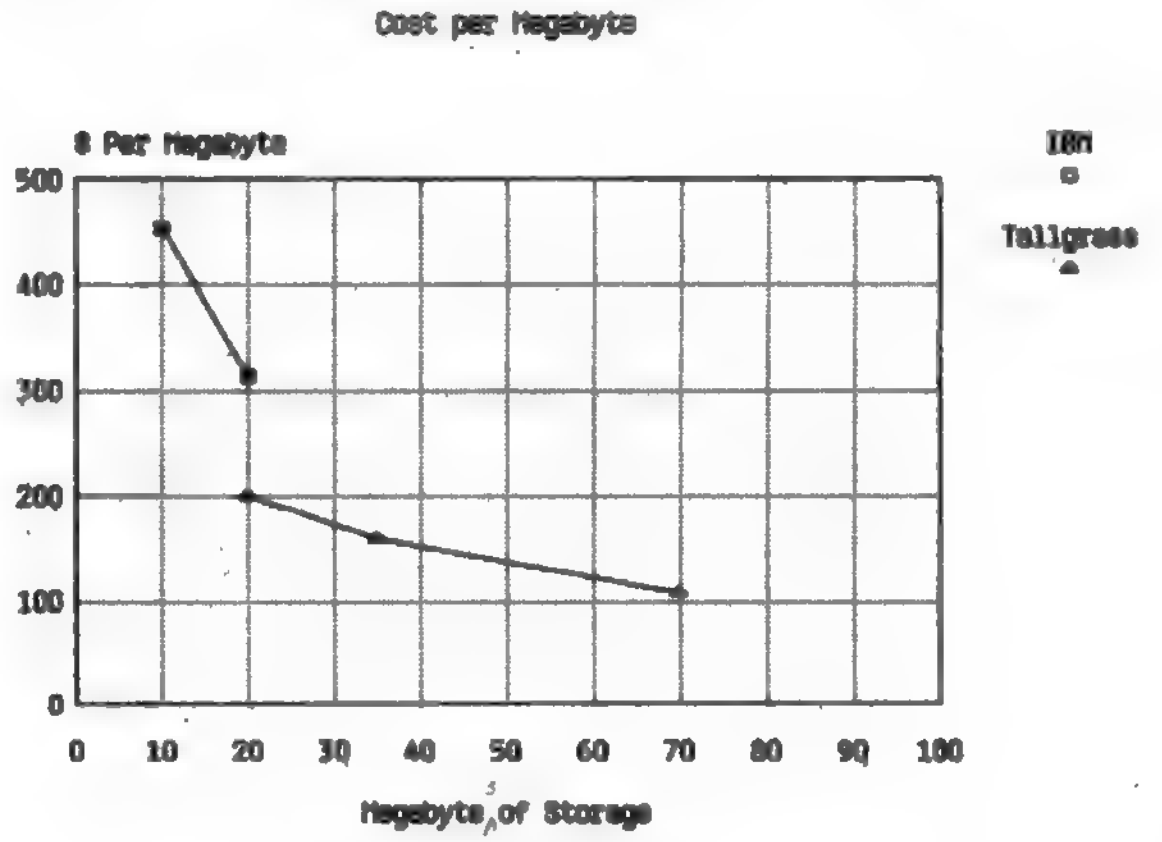
Duplicate directory is exactly that—a second copy of the directory on a reserved track. It provides belt-and-suspenders security for your data by replicating every entry. A utility program will restore the contents of the primary directory from the secondary if you encounter a problem such as a CHKDSK error message or any of several other malfunctions. The price you pay is, of course, speed. And there is no guarantee that the problem in the first directory isn't duplicated in the second.

The third option is cache memory. Cache generally makes systems run faster by reading entire tracks or groups of tracks into memory at the same time. Statistically, the chances are high that the next time you need information it will be in the cache memory and will save you a trip to the disk. As fast as disk is, memory is many times faster, or so the story goes.

There are instances when cache memory can be slower than direct access to the disk. When the records are large, if they are widely separated on disk so that the cache never "hits," or if reads and writes are heavily intermixed, they may cause the cache buffer to be continually flushed and refilled. My performance tests, which did large, sequential reads and writes, caused the system to run slower with the cache than without it. Not just a little slower, but a lot slower: a test that took 12 seconds without cache took 23 seconds with it. It was hitting so seldom that I was measuring the speed of the cache software, not the disk. A typical database program, with many small reads of an index file, probably would have run faster with the cache enabled. You have to experiment with your application to see what works best.

The last option, landing zone, is yet another safety feature designed to protect your data against the gremlins. If you've enabled this feature, the disk heads automatically move to an area on disk where no data is stored after 6 seconds of inactivity. Here the heads can safely contact the disk surface without the danger of destroying data. The idea is that in a power or mechanical failure, the chance of the heads scraping tracks with valuable information will be greatly reduced. The price, again, is performance. It takes time to move the heads to the landing zone area and to return them to where you want to read and write. Again, this feature's use-

Figure 3: The line chart shows the cost per megabyte for the XT and the three Tallgrass units. Price for the XT is a composite price of the hard disks and controller board plus the cost of an Alloy Engineering tape backup system.



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fulness depends on your application. By the way, one of the utility programs allows you to "manually" move the heads to the landing zone, a good idea for storage or shipment.

Unconventional Storage

Tallgrass' method for data storage is a little unconventional in that there are no sectors on the hard disk. All reads and writes are done a full track at a time. Don't construe this as a disadvantage, though, since there is virtually no difference between the time it takes to select a sector from the proper track and the time it takes to read the entire track. Furthermore, it means that the entire contents of the track are stored in memory, not just a few sectors. The result is cache-like performance for the smallest records. Tallgrass' BIOS software converts the memory image of the track into 512-byte sector images that make sense to DOS.

Another nifty feature: you can change the allocation size. As the manual explains in greater depth, you can change the amount of memory controlled by each entry in the File Allocation Table. While poor choices can dramatically slow the system and waste loads of disk space, a proper allocation size can speed things appreciably. The default values which are on the conservative side, will generally keep you out of trouble, but you can fine-tune the environment to your application.

All in all, the implementation of the hardware and software is very good. The additional drives are utterly unobtrusive and indistinguishable from the native drives on the PC. Having that much mass storage available does lead to a kind of euphoria. But the distance between euphoria and terror is about 500 feet—the length of the tape in the cartridge drive.

The Tallgrass units provide a full range of tape management software, permitting you to back up and restore files from any drive. For the complete story on Tallgrass' tape system and another standalone tape system, see the accompanying article, "A Drive Away From Disaster."

I can't emphasize too strongly how important convenient backup is. I'm too busy using my XT to spend time protecting myself from me. Integrated disk and tape are definitely the hot combination, and Tallgrass is leading the field in units of this type. */PC*

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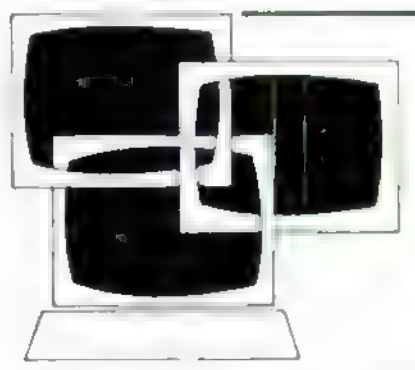
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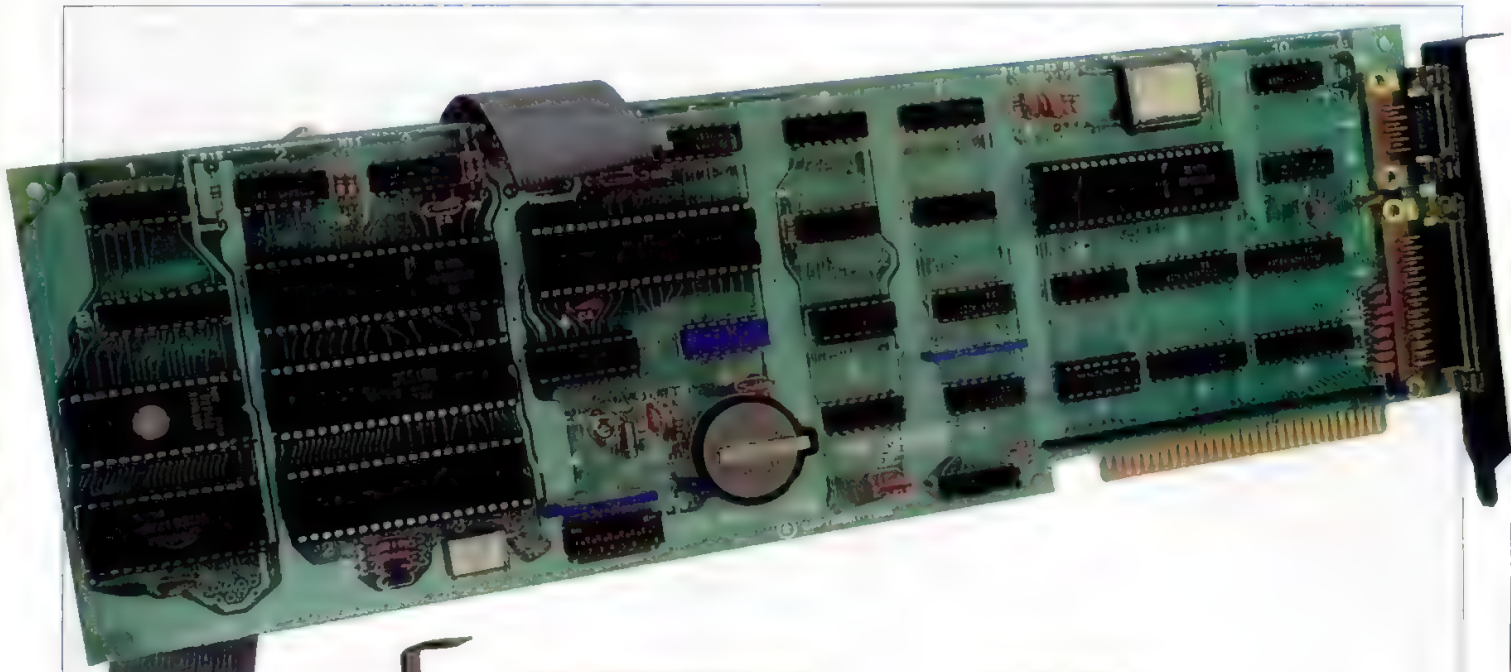
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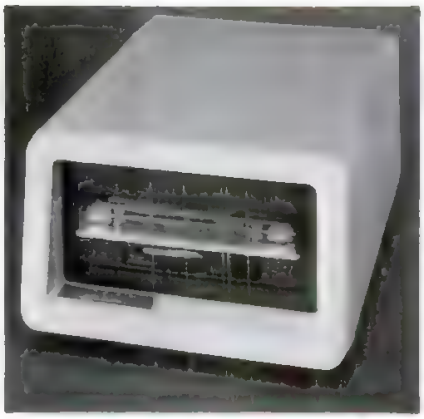
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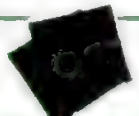
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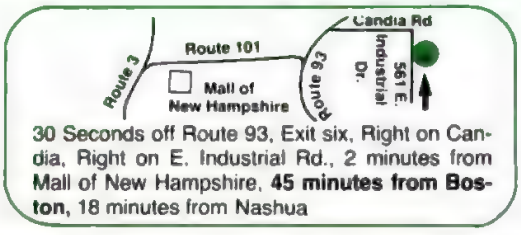
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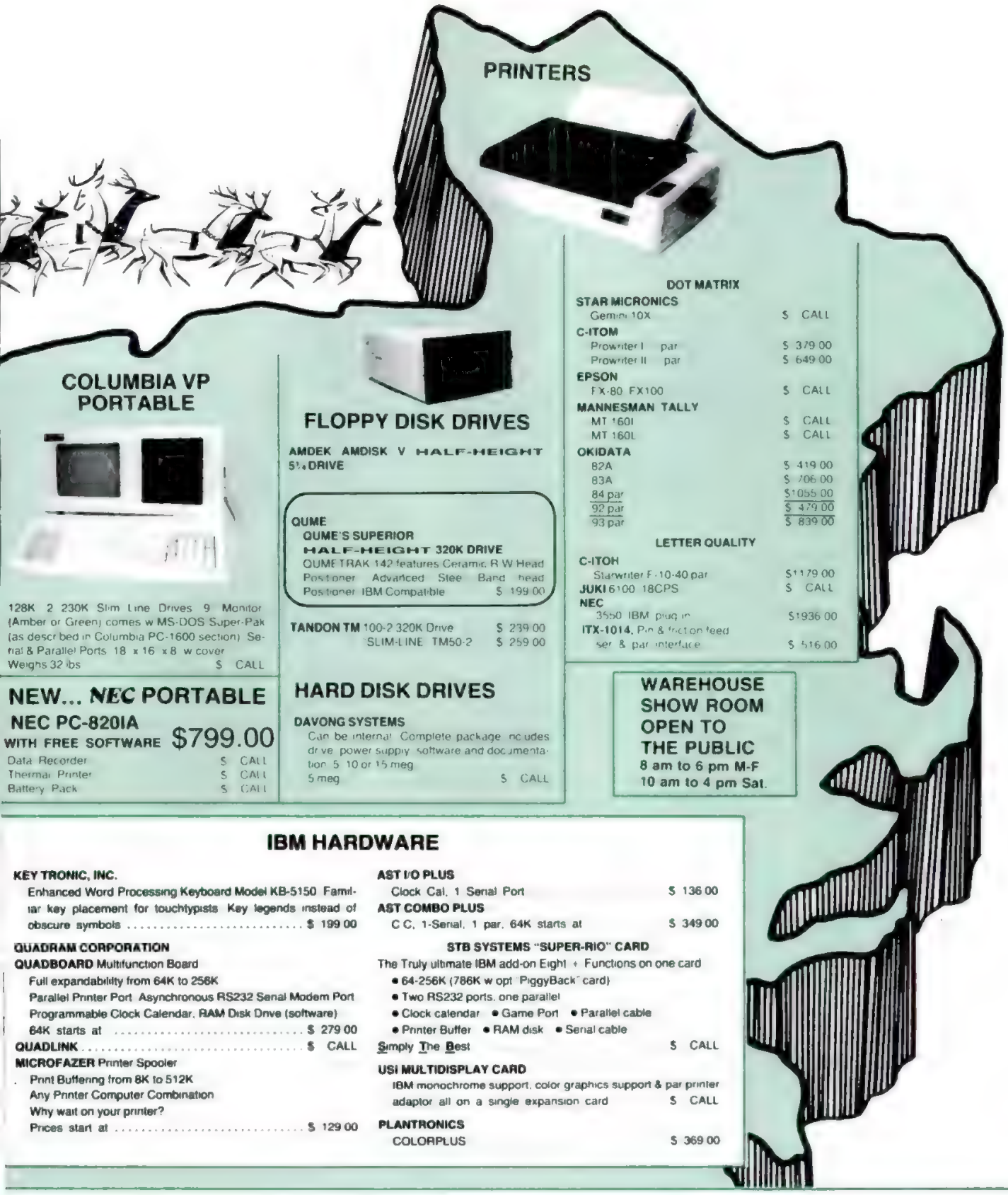


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Mention the word *tape* to virtually any PC user and you'll get a reaction, usually negative. Perhaps it's a reaction to the ponderous world of traditional data processing, where rows of refrigerator-sized tape drives whirl endlessly. Perhaps it's a rejection of the inefficiencies, the slow turnaround time, the priesthood of programmers. Or maybe there are subliminal recollections of microcomputing's infancy, the period when balky computers stored data on balky cassette recorders.

Whatever the reasons, tape drives have been a tough sell. You believe in the inherent reliability of the Winchester hard disk, and so you should. You know you can back up to floppies if you ever get a spare couple of hours. You're banking on the published MTBF (Mean Time Before Failure) of about 8,000 hours on a hard disk. You wear the MTTR (Mean Time To Repair) of 30 minutes like a security blanket. What they don't tell you is that 30 minutes is the time it takes to remove your old drive and pop in a new one. Your new drive will not arrive preloaded with all your data. Will your boss understand when you explain that your machine was just a statistical anomaly?

Physical catastrophe isn't even the main reason for backing up your files. It is far more likely that you will trash some big file yourself by entering incorrect data or running some new version of your file management program with a hidden bug. And take a lesson from my unfortunate experience: Someone ran a DOS 1.1 disk on my XT with a RAMdisk program addressing drive C: while I was at lunch. However, DOS 2.0 was still running. In seconds, my hard disk was not only unbootable but unreadable. Fortunately, I had run backup tests just before lunch and had made two tape copies of my hard disk.

You won't have to worry about explanations, excuses, or hours lost, because the current crop of tape backup devices are reliable and easy to use. They're readily available and easy to install.

Tape Family Tree

The modern cartridge tape drive doesn't seem to have much in common with the units used in data processing, but it bears more than a passing physical resemblance to cassette and 8-track tapes used in audio applications. Its appearance is deceptive, though; the cartridge drive is actually a first cousin to the big reel-to-reel drives and has virtually nothing in common with the audio cassette except two reels in a plastic case. Cartridge tape relies on the same digital recording techniques, fast tape positioning, and error checking as its nine-track data processing forebearers. Instead of writing nine tracks in parallel, though, it records serially on any one of four available tracks.

The two drives that I tested were the

Alloy Computer Products PC-BACKUP and the Tallgrass Technologies 4045. Each uses a cartridge tape drive, is driven by a board that takes up a slot in your PC, and comes with a comprehensive set of utility programs for backup, restoration, and tape management. Both units are attractive and well built, but the deeper and heavier Alloy unit is nearly twice the size of the Tallgrass unit. The Tallgrass machine holds the tape vertically, while the Alloy unit's slot is horizontal. Tallgrass gets the nod for information density, using a newer tape technology that allows 10,000 bits per inch instead of the usual 6,400 bpi. Of course, the higher-density tapes are more expensive, so you pay roughly the same amount per megabyte of storage.

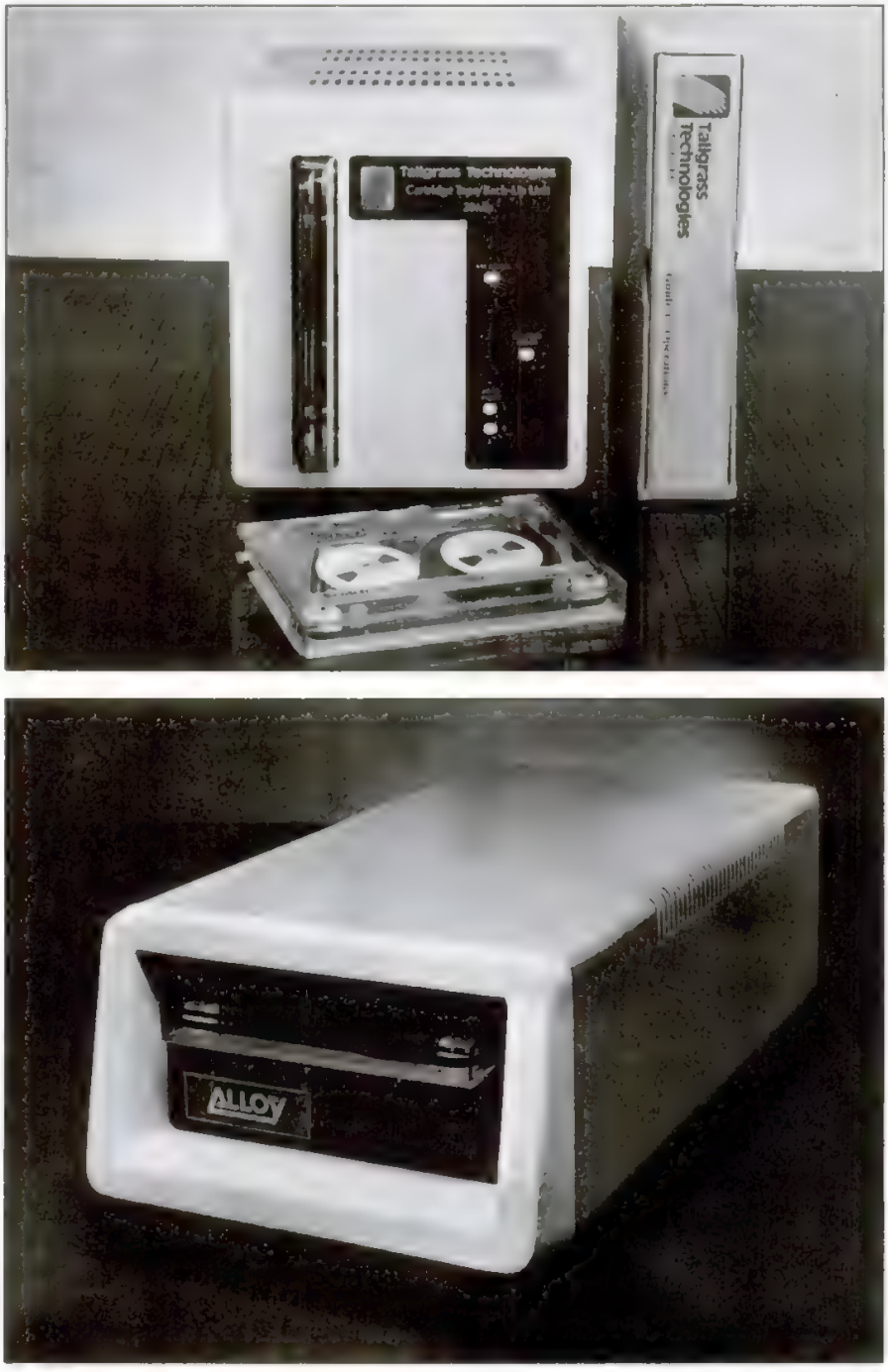
ALLOY'S IS A full-size card while Tallgrass's is short enough to nestle into slot 7 of a PC-XT, behind the floppy disk.

There is a dramatic difference in the interface cards. While both plug into the PC, Alloy's is a full-size card while Tallgrass's is short enough to nestle into slot 7 of a PC-XT, behind the floppy disk. Most of the intelligence of Tallgrass's machine is inside the tape backup unit, while in Alloy's offering it is on the interface card. Alloy's drive cabinet is relatively uncluttered, containing little more than the power supply and the tape drive. Tallgrass's has a full tape controller in the cabinet as well as the other components. In operation, both run quietly and barely get warm to the touch.

The real difference is not in the hardware, but in the software. Each manufacturer has come to this market from a different perspective. Tallgrass is arguably the highest-tech supplier of hard disk addons for the PC, and all its products include tape backup. (See the article on the Tallgrass lineup in this issue, "Tallgrass Hard Disks: Megabytes of Euphoria.") It stands to reason that it would adapt and repackage its backup technology for a standalone situation. Tallgrass came into existence specifically to serve the PC market, but Alloy got its start back in 1978, making an interface card to connect an S-100-based computer to a nine-track tape drive. The business expanded into cartridge drives as that technology matured, culminating in the design of the tape backup subsystem for Altos's ACS8000 series of multiuser microcomputers with hard disk. Once hard disks became available for the PC, the transition into the 16-bit world was a natural.

Tallgrass's Software

Tallgrass provides a variety of backup and utility software. The utility program not only tests and formats tapes, it also



Tallgrass Technologies' tape back-up unit (top) and Alloy Computer Products' offering. They don't look very much alike, but the real difference is in their software.

allows you to test the interface electronics and certify the accuracy and quality of a tape prior to use. There are two types of file backup: one is oriented to individual files, while the other backs up entire disk surfaces to tape. The program that provides file-by-file transfer will accept any MS-DOS drive (including floppies) and any file specification, including wild cards. The surface-oriented backup program takes the contents of a hard disk surface and copies them to tape.

Both programs ask to which of the four tracks you would like to store the files. You must make note of which tracks have been used, but the software protects you from inadvertently overwriting backup files. For example, if you had saved a group of files to track zero and then tried to save another group of files to the same track, the program would inform you that the track in question needed to be erased. There is no way to append additional files to a track with backup files on it; it must first be erased and then totally rerecorded. In order to erase the tape, you must use the tape utility program provided. Thus there is no danger of accidentally smashing your backup files; you must do it deliberately.

The surface-to-track program is specifically geared to backing up Tallgrass hard disks. When the disk is rather full, surface backup is faster than file backup because it needn't be concerned with directory and file allocation entries. You would probably use the file-by-file version for most backup because it is more convenient and because it is quicker when the disk is only partially full. Also bear in mind that file-by-file backups can be restored to any other hard or floppy device, but full surface backups can only be restored to the surface from which they came. This is because a full surface backup may contain bad tracks, which will not necessarily agree with those of another disk surface. By the way, if the files specified on the full disk surface will not fit on the requested track, the software automatically spills it over to the next tape track (assuming there is one). That track is then no longer available for file backup, since additional files cannot be appended to it.

THERE IS NO danger of accidentally smashing your backup files; you must do it deliberately.

The backup and restore programs, TGBACKUP and TGRESTOR, are inconvenient because you can only invoke them through the command line. For example, if you want to back up all .COM files on drive C: and store them on tape track 2, you enter,

```
TGBACKUP C:*.COM /T2
```

There is no way to back up .COM and .EXE files in the same pass; each must go

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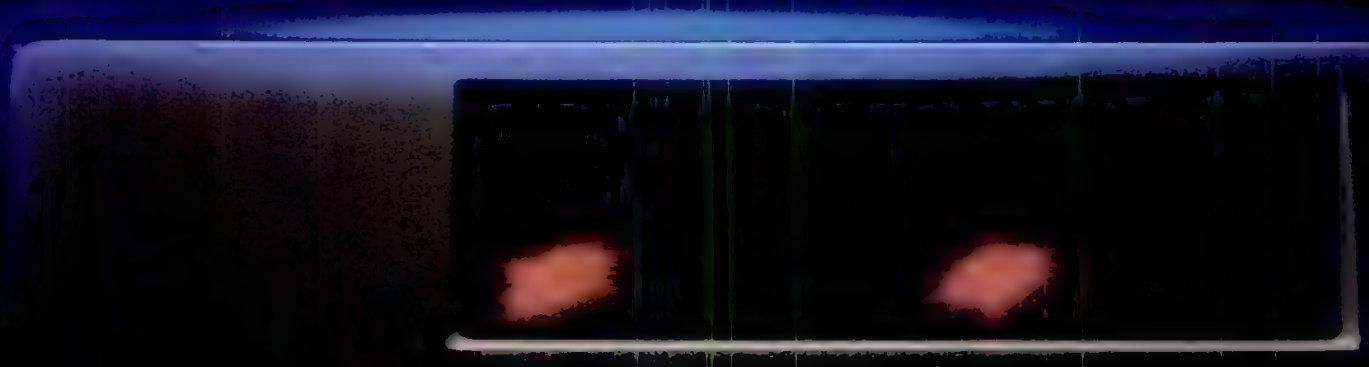
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onto a different track. On the other hand, TGBACKUP, like DOS 2.0 BACKUP, allows you to specify date and other parameters to control the files chosen for backup.

Alloy's Software

The biggest advantage to Alloy's software is its history, and that's not bad. Probably the most popular backup system for microcomputers, Tape Interchange Program (TIP), is the benchmark against which others will be judged. TIP does not have the extensive diagnostics that Tallgrass offers. It does not provide full-surface backup. But it does provide ease of use in file-by-file backup and restoration. It permits the usual wild cards in filenames for flexible backup, and it can handle any storage device, whether hard or floppy.

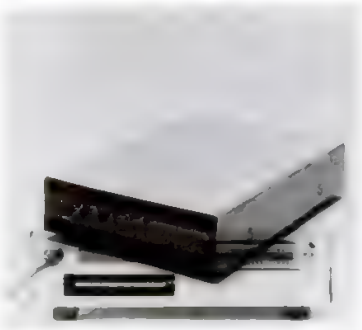
TIP's roots in CP/M and MP/M are evident in its features and operation, especially the Save Set feature. The multiuser version of TIP needed a simple way to back up multiple copies of the same filename with different contents. Since TIP treats the four tape tracks as one long tape, it permits you to append to the tape. But each time you do so, it creates a new save set or preface to the filename, allowing new files of the same name to be distinguished from others backed up previously. You can override the automatic save set feature and assign any number to the set. One thing I've never liked about TIP is that you have to enter the save set in hexadecimal. This is an inconvenience, but nothing to lose sleep over. In most PC applications, you'll never even use the feature.

THE BACKUP and restore programs are inconvenient because you can only invoke them through the command line.

Alloy provides a linkable library of tape routines, so you can control all the functions of the tape drive or execute any backup or restore procedures from interpreted BASIC programs. This handy feature allows you to customize the tape routines to your needs. The manual is quite explicit on how to do the necessary BLOADs and CALLs, and a demo program is included on disk.

You can back up files with TIP either from the command line or just by entering TIP. In the latter case, the available options are presented with a screen display for each one. If you select disk to tape backup or disk to tape append, you may enter as many specific filenames or filenames with wild cards as you like. You can even back up different drives in the same pass. Of course, with power comes responsibility. You have to keep good notes to determine what files came from

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where, information you'll need should you ever have to restore a disk from tape. A final nice feature: you can direct TIP to a file for its operating instructions. You can have as many instruction files on disk as you like, each for a specific backup or restoration task.

Performance and Price

It's almost silly to talk about the performance of these units in comparative numbers—they're that fast and effective. Backing up a PC-XT with about 6 megabytes worth of files on the hard disk took only 5½ minutes with the Tallgrass unit and a tick under 4 with the Alloy system. They handle verification of the files being backed up in different fashions: Tallgrass does a full read after each write, so the backup time is about 50 percent longer. Alloy's method is to break out verification as a separate task, selectable from TIP's main menu. If you want verification, it will take longer with Alloy.

TALLGRASS HAS the edge in multi-PC installations.

As I mentioned earlier, the Tallgrass unit records more data on the tape, up to 45 megabytes, but the tape costs more. The cost per megabyte is about the same. The real difference in cost occurs if you are going to equip multiple PCs with interface cards, but buy only one tape drive. The units are identically priced at $2,195. Tallgrass charges an additional $149 for its interface board, but that price is more affordable for multiple PCs with hard disk. You can then just bring the tape drive around to each of the machines, plug it in, and your data is secure. You can do the same with the Alloy machine, but the cost per PC is going to be higher and the cost in terms of the space you have to give up inside the computer is greater. Additional Alloy cards, at $795 each, are more expensive than the Tallgrass card, but still reasonable, given the amount of circuitry on the board. The first board is included with the unit.

TIP remains the software of choice for easy tape backup and restoration. Tallgrass has the edge in multi-PC installations, although I predict that if the marketplace dictates, Alloy will produce a simpler, less expensive interface board.

Tape subsystems are nearly a necessity for any computer with large files on hard disk. One disk crash or trashed file is all it takes to justify the investment. You can play the odds, but who wants to buy a lock after your house has been robbed? The more hard disk-based systems you have, the more attractive tape backup becomes. */PC*

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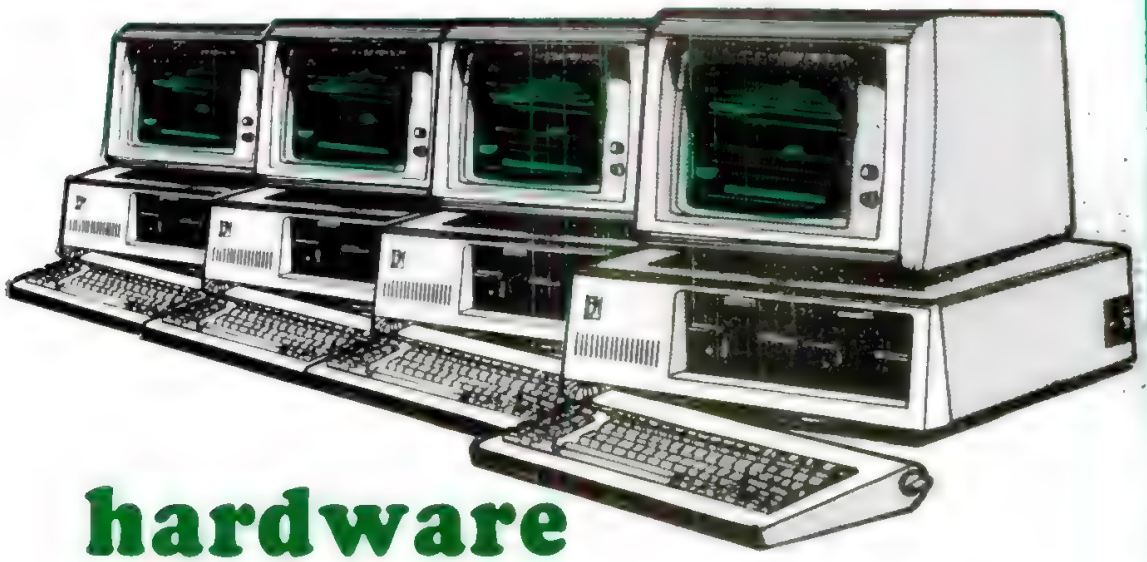
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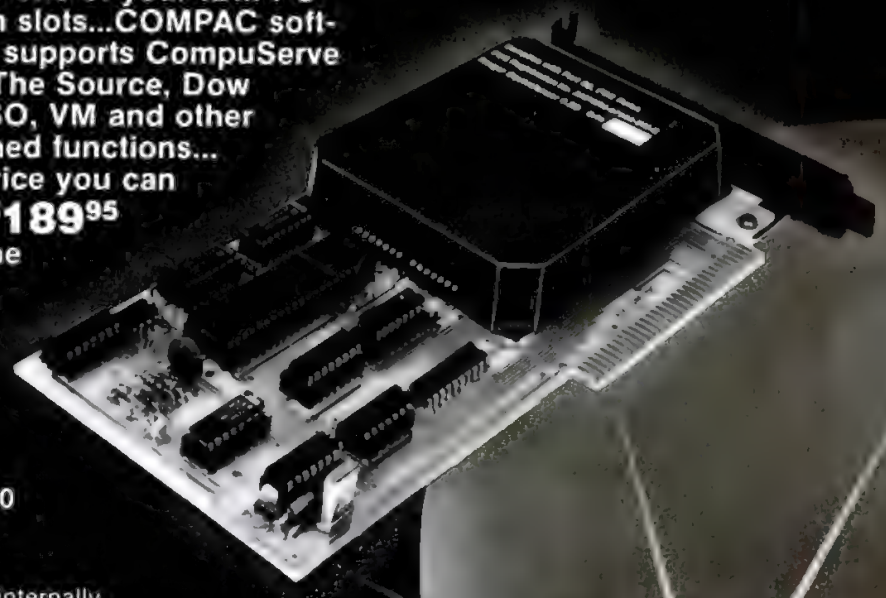
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Software and files of data and text can be linked with PC-DOS 2.0's PATH command. But a program can't travel down every path it might need when it goes to work.

Avoiding Dead-End Paths On The Hard Disk

The office was all right until we brought in a third filing cabinet. It was much bigger than the other two, but it filled up rapidly. From that point on, we frequently couldn't find things. We had previously gotten along just by remembering where we had last placed documents—the filing system itself wasn't very helpful because the office manager insisted on using broad, all-purpose names for the files, such as "Correspondence," "Committees," and "Budget." Now that we had three large cabinets containing numerous file folders packed 6-inches thick, we often played long hide-and-seek games with our documents.

The 10-megabyte hard disk in an IBM XT is much like that third filing cabinet. Many more files can be stored and misplaced in that much memory. Once you add a hard disk, the organizational ability of PC-DOS 1.1 is not up to the task of helping you quickly locate a file whose name you barely remember.

PC-DOS 1.1 distinguishes files by the filenames and their three-character extensions. With judicious use of the DIR command, partial filenames, and the asterisk, a search for a forgotten file on a diskette can be narrowed down considerably.

My correspondence files, for example, could be grouped together if I always used the extension .LTR in the filenames for letters. If the first part of these filenames were consistently self-explanatory, searching for a particular letter would not be too difficult. But if I wrote frequently to one company—say the Doozer Construction Co.—the hard disk might end up storing files called "Doozer18.LTR," "Doozer19.LTR," etc. These filenames by themselves would be of little help in telling one letter to Doozer Co. from another.

I need a better means of organizing my files. I'd like to subdivide my correspondence files into smaller categories. Then I could have a separate category of files for Doozer letters. Within that file, each letter could be identified by a more distinctive filename. Although I cannot do that with PC-DOS 1.1, with PC-DOS 2.0 I can. The new file structure can be used to advantage, but I found that some desirable methods are still beyond the reach of the PC's present software. (I'll demonstrate this with some examples involving *SuperCalc* and *SuperWriter*.)

The File Structure

IBM applied several metaphors in the terminology used in its file structure for PC-DOS 2.0. First, a botanical image: PC-DOS 2.0 employs a tree-structured file sys-

tem. There is a root directory for the system; files branch off from the root and from each other. Switching to the next metaphor, PC-DOS 2.0 can be said to treat certain files as "parents" and others as "children" belonging to specific parents. Each child can have only one parent, but one parent can have many children; each child can become a parent. The result is a hierarchical file system. The root or system files have under them a "family" of subfiles, with lower level files below them. In PC-DOS 2.0, levels of the file system are measured by how far a file is from the root directory. To add one more metaphor, PC-DOS 2.0 is able to follow a "path" from wherever I am in the file structure to reach a file I want to find. It can even travel into another disk's subdirectory to find that file.

PC-DOS 2.0 can be said to treat certain files as "parents" and others as "children" belonging to specific parents.

IBM introduced PC-DOS 2.0 in early 1983, at the same time as its hard-disk-equipped PC-XT. Most software vendors are still catching up; few have yet released revised programs that take advantage of the added capabilities of the tree-structured filing system. Programs written under PC-DOS 1.1 are designed to use diskette drives A: and B:, but most can be run from the hard disk and use it as a storage medium. But, as you will see, these programs' inability to move from level to level in the file directory neglects an important part of PC-DOS 2.0.

Creating a New Directory

Let us take as an example the procedure necessary to install Sorcim's *SuperCalc* program and its files on the XT's hard disk. The *SuperCalc* program consists of a number of files (one is the file containing the "answer screen") that are called from the main program, named "SC.COM." The names of output files created by *SuperCalc* users are automatically given a ".CAL" extension. These files might logically be stored separately from the system files. Create a subdirectory in the root directory called "SC" for the *SuperCalc* system files; also create a subdirectory one level down from SC for the output files, to be labelled "CALC." Before you can create a directory, the hard disk must be prepared and partitioned, and PC-DOS 2.0 must be running as the operating system.

The MKDIR (or MD, for short) command is used to create a new subdirectory. PC-DOS 2.0 uses the left slash (\) as the delimiter for all the directory commands. To create the SC subdirectory, enter this:

```
C:MD \SC.
```

Then to list all the files in the root directory, enter:

```
DIR \
```

The list that appears will conclude with the SC subdirectory.

To add the CALC subdirectory to the SC subdirectory, you need to record that the CALC files come under the SC directory; this is accomplished by entering:

```
C:MD\SC\CALC.
```

So far you have created the file structure shown in Figure 1.

Putting Files in Subdirectories

Once you have made these two subdirectories, the next step is to copy your existing files to them. The PC-DOS 2.0 COPY command is an upgraded version of the one used in PC-DOS 1.1. COPY now includes the means to copy files from any directory on one disk to any directory on another. In the present case, we want to copy all the *SuperCalc* system files and the .CAL files from disk A: to the hard disk, which is designated disk C:.

Start by copying all the files from the *SuperCalc* system disk to the hard disk's SC subdirectory. Enter the following:

```
C:COPY A:*.* C:\SC
```

When translated, this means "get the COPY command program from drive C: and copy files with every filename (first asterisk) and every extension (second asterisk) from drive A: onto drive C:, subdirectory SC." (If C: were the default drive already, "C:" could be omitted both places.)

Since the output files all use a ".CAL" extension, the .CAL files can be copied by keying in this:

```
C:COPY A:*.CAL C:\SC\CALC
```

That means "copy all the files with a '.CAL' extension from drive A: onto drive C: in subdirectory CALC under subdirectory SC." As each file is copied, you are informed of the filename and the new location, concluding with a report of how many files were copied.

The DIR command can be used to verify that the files are now in the two subdirectories:

```
DIR C:\SC
```

and then

```
DIR C:\SC\CALC.
```

Now the *SuperCalc* program and its files reside in the subdirectories on the hard disk.

The Current Directory

The operating system is set up to remember and use both a default drive

Figure 1: The file structure of the hard disk after setting up the root directory and defining subdirectories on two levels. The second level will be for the SuperCalc program; the third level will hold the data files for that program.

Level 1	ROOT DIRECTORY	(contains system files)
Level 2	SC	(no files yet)
Level 3	CALC	(no files yet)

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Figure 2: File structure with three levels for a hard disk containing SuperCalc, SuperWriter, and data and text files for these programs.

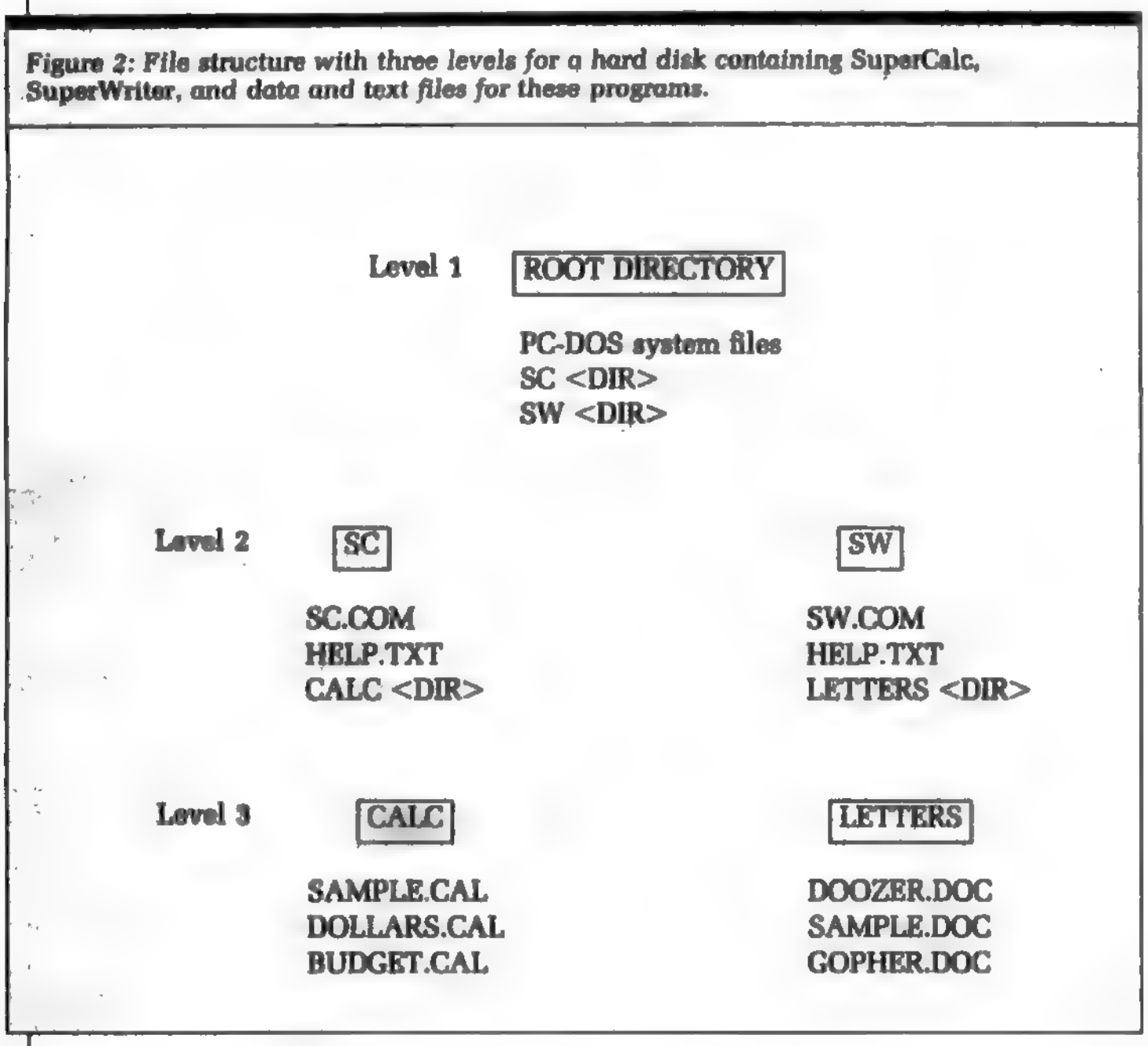


Figure 3: A TREE listing of the files shown in Figure 2.

```
A>TREE /F

DIRECTORY PATH LISTING FOR VOLUME SUPER

Path: \SC

Sub-directories:  CALC

Files:            SC.COM
                  HELP.TXT


Path: \SC\CALC

Sub-directories:  None

Files:            SAMPLE.CAL
                  DOLLARS.CAL
                  BUDGET.CAL


Path: \SW

Sub-directories:  LETTERS

Files:            SW.COM
                  HELP.TXT

Path: \SW\LETTERS

Sub-directories:  None

Files:            DOOZER.DOC
                  SAMPLE.DOC
                  GOPHER.DOC
```

and the "current directory" on that drive. In other words, PC-DOS always looks for files on the same drive—the default drive—until you designate another drive. Similarly, PC-DOS works out of only one directory at a time, the current directory. Files on other drives or in other subdirectories are inaccessible, unless you change the default drive or current directory. When the PC is booted up, the default drive is A:. If the A: drive's door is open, however, PC-DOS 2.0 is booted from the C: hard disk and its root directory becomes the current directory.

While you are in this drive's root directory, the SC files can be listed, typed, and so forth by using the subdirectory \SC designation. For example, you could enter this:

```
DIR \SC
```

But the SC files cannot be run from the root directory. For example, if you enter

```
SC
```

to execute the *SuperCalc* program, this error message will appear: "Bad command or filename." This tells you that the SC files are inaccessible from the root directory. While in the root directory, if you try keying in the command

```
DIR
```

by itself, you'll see that the file SC.COM is not there.

To run the *SuperCalc* program under PC-DOS 2.0, you must move from the root directory to the SC subdirectory. The operating system requires you to make the SC subdirectory become the current directory. CHDIR (or CD, in its abbreviated form) is the command that will change the current directory; its syntax is identical to that for the MD command. To move from the root directory to the SC subdirectory, enter this:

```
CD \SC
```

Now try DIR. All the *SuperCalc* system files should be listed. The CALC subdirectory can be made the subdirectory of SC by entering this:

```
CD \SC\CALC
```

or just

```
CD \CALC
```

since SC already is the current directory.

The PC-DOS 2.0 system commands are of two types: internal and external. Practically speaking this means that the internal commands, such as DIR and CD, can be called from any subdirectory location, since they are called from the computer's RAM. The external commands, however, will run only from the root directory. For example, you can simply enter

```
DIR
```

to list the files in the CALC subdirectory, but only if CALC is the current directory. On the other hand, the CD command must be able to run from any subdirectory or you would never be able to get out of the current directory. The external files can be accessed only by using CD to return to the root directory.

TREEs and PATHs

PC-DOS 2.0 provides two commands for organizing the file structure: TREE and PATH.

TREE is a command that calls on an important external system file on the root directory, which displays the structure of the directories on the disk. Adding \F to this command lists the files in each subdirectory as well. Hence, entering this:

```
TREE \F
```

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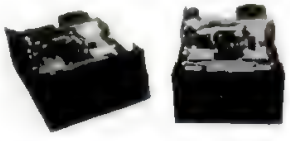
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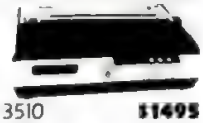
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will display the structure and contents of the hard disk. This information can be sent to the printer by entering this:

```
TREE \F >PRN.
```

This is a very nice way to review the contents of the hard disk. (Oh, if only a handful of symbols could put my office's file cabinets into order as easily!)

If your disk had both *SuperCalc* and *SuperWriter* files on it with the names and structure shown in Figure 2, its TREE listing would look like Figure 3.

The term "path" is used with two meanings in the PC-DOS 2.0 manual: a "path" describes a route through the subdirectories to a particular file; also, "PATH" is a PC-DOS 2.0 command used to set up a route to a particular file. Starting from the root directory, the path (in the first sense) to the DOOZER.DOC file can be described in this form:

```
\SW\LETTERS\DOOZER.DOC
```

The slash preceding SW (the name of the file with the *SuperWriter* program) indicates that the search should begin with the root directory. The PATH command (second sense) is used to open access from the current directory to another subdirectory. Thus, if you were preparing a report while in the SW subdirectory and wanted to include a *SuperCalc* output file residing in the CALC subdirectory, it would make sense that a route to those .CAL files could be established with the command

```
PATH \SC\CALC.
```

However, it just will not work. This is a major flaw in PC-DOS 2.0.

A Blocked Path

I'm sorry if I raised your hopes before leading you down a dead-end path. Unfortunately, PC-DOS 2.0 makes it impossible to access output files from another directory. Furthermore, software developed for PC-DOS 1.1 will not recognize path (in the first sense) indicators that lead to another directory. PC-DOS 2.0 provides all the commands to set up a hierarchy of subdirectories, but I know of no available software that utilizes this hierarchical structure. Even the revised BASIC supplied with the XT has no provision for accessing subdirectories. For now, the paths to other subdirectories are blocked.

SuperCalc, for example, can be run when SC is the current directory. But

EXTERNAL commands will run only from the root directory.

SuperCalc cannot get at the .CAL files in our CALC subdirectory. Alternatively, setting CALC as the current directory blocks access to the files in the SC directory. The PATH command is the way to open access to other directories or drives. PATH, however, works only with command or batch files; it will not search for or load data or text files. Hence the path to our DOOZER.DOC file could not be opened with:

```
PATH \SW\LETTERS.
```

If the current directory were set for the CALC subdirectory and a path were defined with PATH \SC, the SC.COM file would run *SuperCalc*; however, it would immediately crash because the SC.PGM file, which must be called by SC.COM, cannot be accessed from the CALC subdirectory. Bummer!

Given the limitations of PC-DOS 2.0 and the software we have, in practice we are still restricted to using only a bi-level file structure on the hard disk. All the files must be kept in either the root directory or a subdirectory one level down. For example, in order to use *SuperCalc* and get at its output files, the *SuperCalc* system files and its .CAL files must be stored in the same directory. While a bi-level file structure is twice as nice as a single-level structure, the 10 million bytes on the fixed disk demand a more extended organizational structure.

Retreating from the Path

Since we went astray on the CALC path, the one that held the .CAL files, let's barricade that path. Before folding up the CALC subdirectory, save the files in it by moving them up to the SC subdirectory. Since COPY is an internal PC-DOS file, it will run from whatever subdirectory is now the current directory. Enter this command:

```
COPY \SC\CALC\*.CAL \SC
```

That command moves all the .CAL files from the \SC\CALC subdirectory to the \SC "parent" subdirectory. Before a subdirectory can be removed, all its files must be erased. That's easy. Just enter:

```
ERASE \SC\CALC\*.*
```

The dubious XT will respond: "ARE YOU SURE?" Always be careful with the ERASE command; it's easy to wipe out the wrong directory. (In fact, the hard disk's root directory and all your PC-DOS files will disappear if you enter this simple command: ERASE \.)

Removing the CALC subdirectory is accomplished with the RMDIR or RD command. Since neither the root directory nor a current directory can be removed, make sure that the current directory is not the one to be removed, that is, not CALC. Then eliminate CALC with this command:

```
RD \SC\CALC
```

To run *SuperCalc* (at last!), first make SC be the current directory by keying in:

```
CD \SC
```

Then enter:

```
SC.COM
```

When *SuperCalc* runs, it will have access to all of the output files, which were moved into the SC directory. The fixed disk performs the program's save and load routines about 10 times faster than the diskette drives. This speed advantage is rarely noted in the course of running *SuperCalc*, but you should appreciate it when using a word processor such as *SuperWriter*.

The potential benefits of a tree-structured file system cannot yet be realized on the IBM XT. There are already rumors that IBM will release a PC-DOS 2.1 that will provide a solution. But some software manufacturers will have caught up with version 2.0 before IBM's next move. For example, I found that a new version of Lotus' 1-2-3, purported to be capable of accessing files in subdirectories, can now be ordered. In the meantime, the IBM XT's hard disk offers a huge amount of storage, but the means to organize it are still too limited. */PC*

James Perotti is Coordinator of the Computer Systems and Business Department at Ohio University. He has an MBA, a PhD in philosophy, and authored a book on Heidegger.

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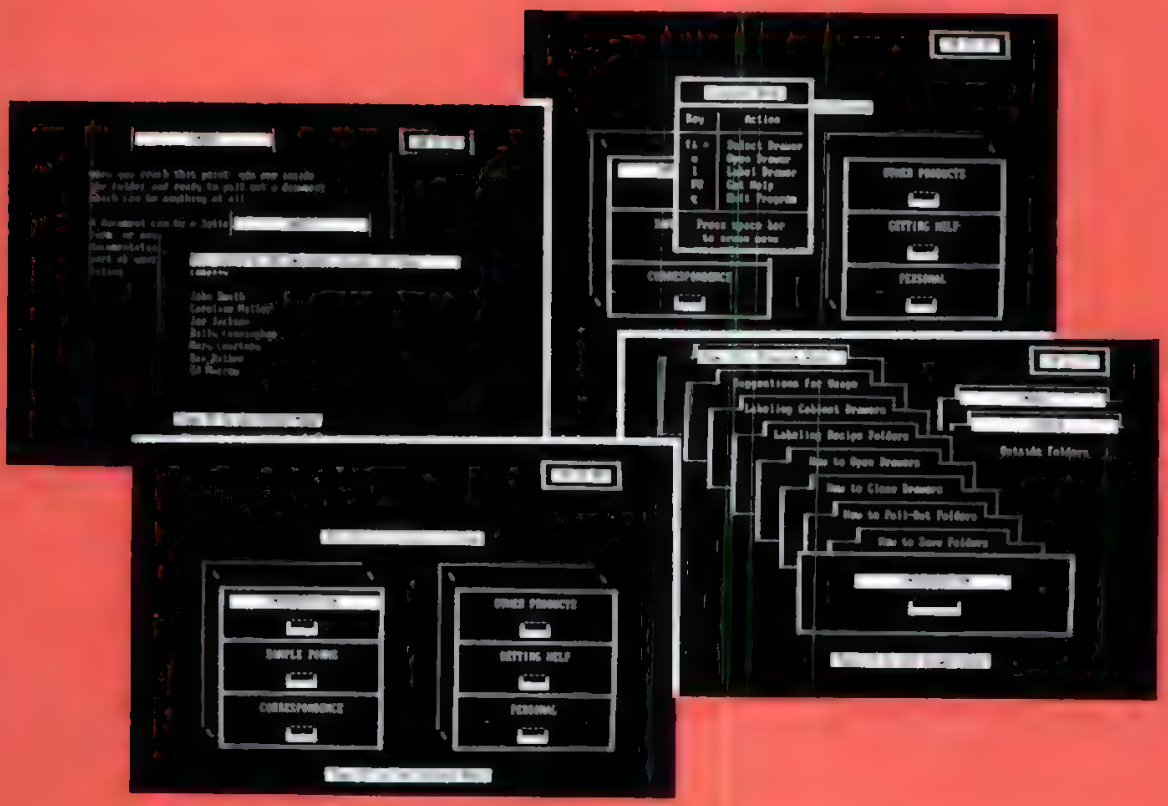
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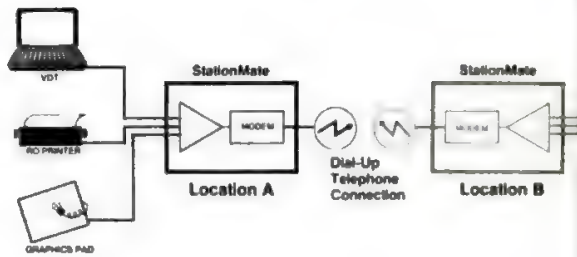
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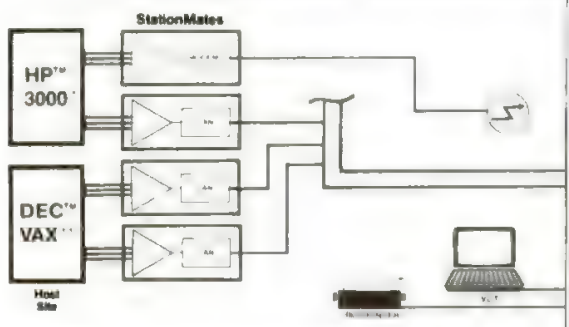
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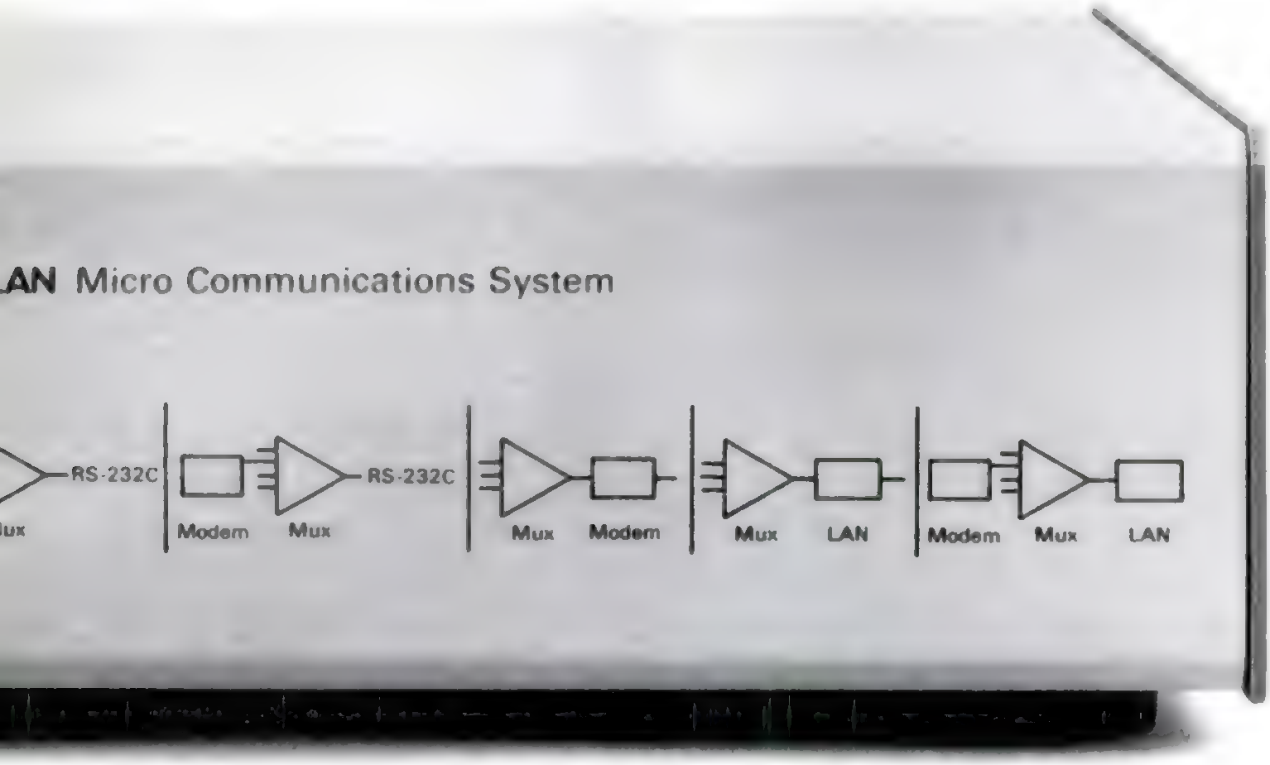


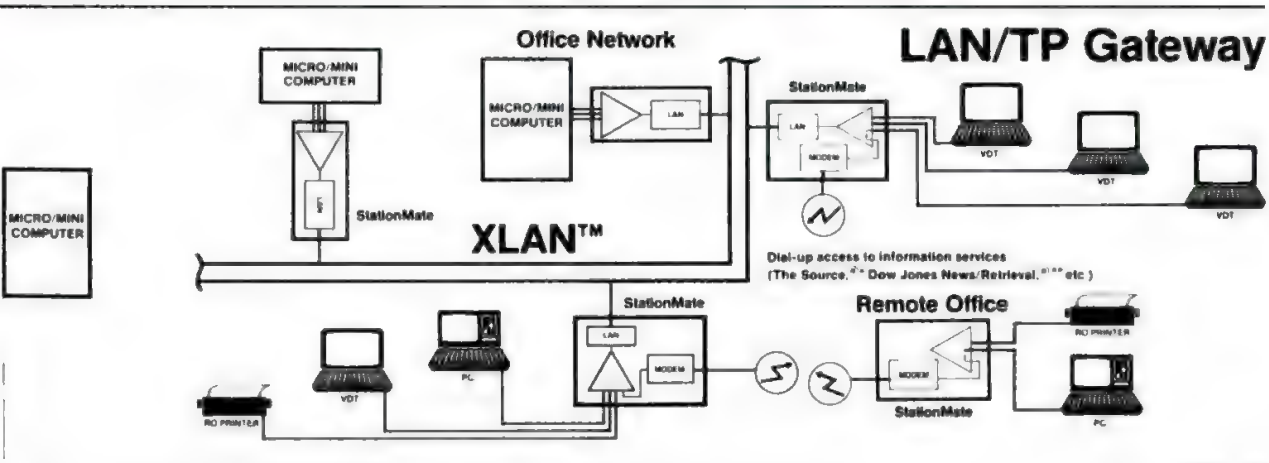


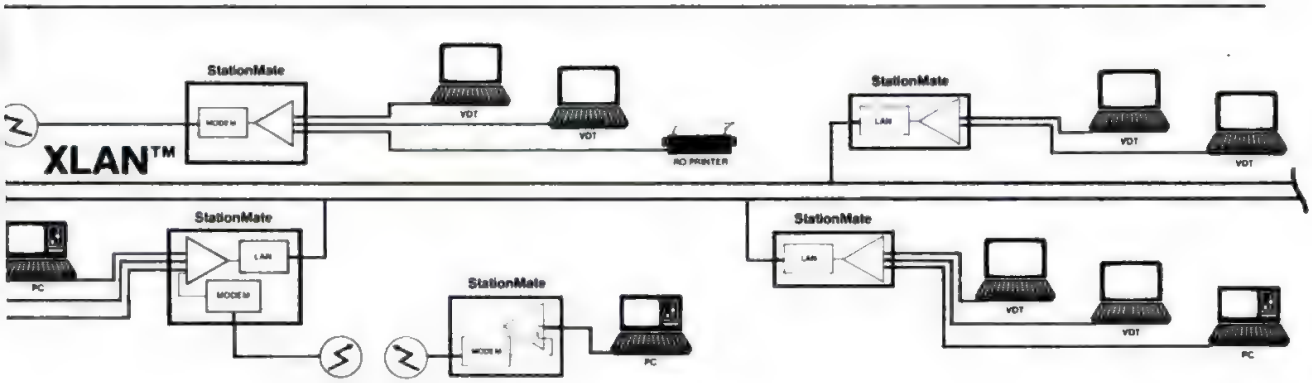
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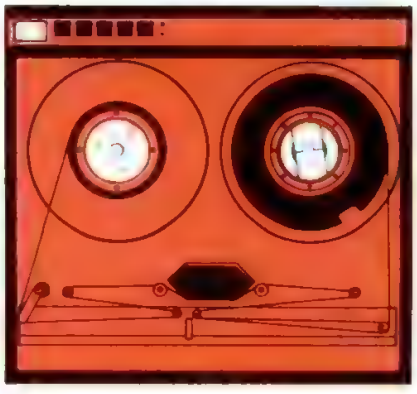

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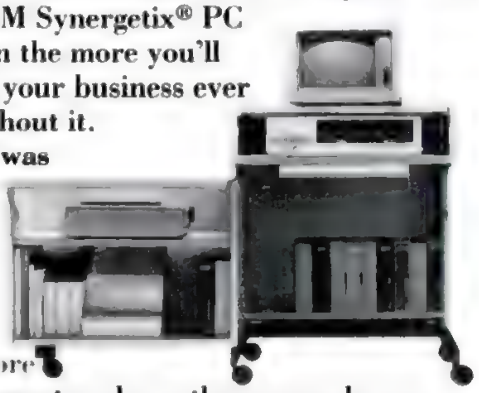
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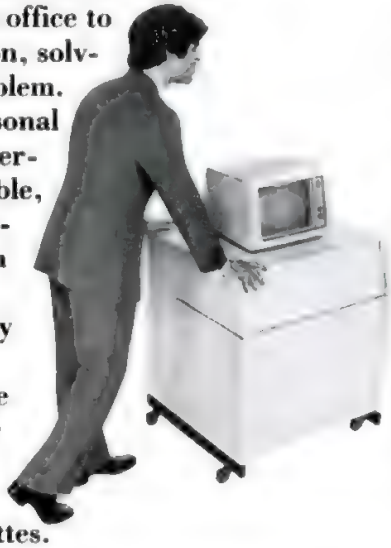
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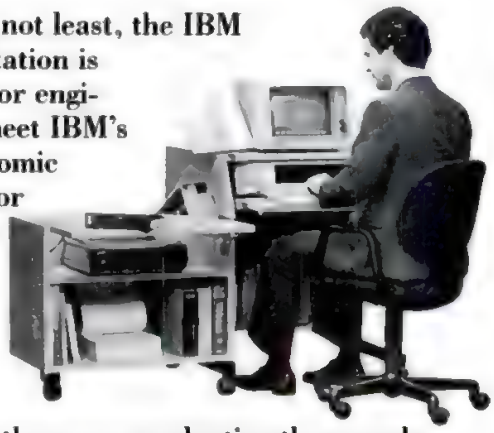


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```
                YEAR is 913 AD                                    28719

Ruler of SEGOVIA Died 7       AX: RCS 6.939495 RCP 1.97433

Ruler of VALENCIA Died 7      AY: RCS 6.596704 RCP 1.978831

Ruler of SEVILLE Died 4       AZ: RCS 1.453352 RCP 6.83627

Province Summary List
GALLICIA        3.809541  1.762264      LEON          28.60593  7    6    7    11
LEON            4.788736  1.1                         0         7    5    6    11
CASTILE         10.61729  2.358566      LEON          28.90634  7    2    9    11
NAVARRE         1.272625  1.1                         0         7    1    2    11
ARAGON          6.340386  1.999999                    0         7    4    4    11
CATALONIA       10.72772  1.1                         0         7    10   7    11
COIMBRA         6.144661  1.870401      CORDOBA       23.04565  7    4    9    12
SEGOVIA         11.05058  2.600319      BADAJOZ       19.125    0    7    2    21
OSMA            10.52994  1.1                         0         7    8    6    21
SARAGOSSA       10.33167  1.1                         0         7    6    6    12
TARRAGONA       3.450203  1.1                         0         7    3    5    21
LISBON          2.667913  1.253302      CORDOBA       25.00941  7    2    5    21
BADAJOZ         10.73302  1.1                         0         7    10   1    21
TOLEDO          11.05057  2.703031      CORDOBA       27.61265  7    2    7    21
VALENCIA        8.044052  2.358566      SARAGOSSA     19.29814  0    7    2    21
CORDOBA         6.236996  1.1                         0         -24  7    9    21
GRANADA         10.78333  2.476495      MALAGA        17.06119  7    3    1    22
MURCIA          1.268509  1.238955      CORDOBA       26.47349  7    3    8    22
ALGARVE         1.296614  1.78394       CORDOBA       25.50438  7    3    5    21
SEVILLE         1.614475  2.223791      CORDOBA       20.1375   0    1    7    21
MALAGA          4.400439  1.1                         0         7    7    4    12
ALMERIA         1.072651  1.344651      CORDOBA       19.47831  7    3    2    22

LEON Repels a Raid by GALLICIA
LEON ACA 3.000478 + 0 SEGOVIA DCA 4.003818
SEGOVIA is not Conquered by LEON
 .5005001 LEON Retains Sovereignty over CASTILE
                Ruler of ARAGON Dies
ARAGON ACA 2.1813 + 0 NAVARRE DCA 6.485345
NAVARRE is not Conquered by ARAGON
CATALONIA ACA 4.499628 + 0 ARAGON DCA 4.542459
ARAGON is not Conquered by CATALONIA
SARAGOSSA ACA 4.918854 + 0 TARRAGONA DCA 4.195738
                SARAGOSSA Defeats TARRAGONA
                SARAGOSSA is Suzereign of TARRAGONA
    Aggression at a Distance BADAJOZ,SEGOVIA,LEON
VALENCIA ACA 3.480507 + 0 SARAGOSSA DCA 7.777371
SARAGOSSA is not Conquered by VALENCIA
 .5005001 CORDOBA Retains Sovereignty over SEVILLE
Province Printouts: (S)uzereign list, (P)rovince list or e(X)it

Diplomacy
LEON            Antagonizes   CASTILE     17.6763   19.06738
CASTILE         Befriends     LEON        20.02266  18.11838
CATALONIA       Befriends     ARAGON      19.00681  17.52767
TARRAGONA       Antagonizes   TARRAGONA   21.60649  21.60649
GRANADA         Antagonizes   ALMERIA     20.04922  19.5979
ALGARVE         Befriends     LISBON      26.35751  25.72775
Taxation
LEON            .1003935
SARAGOSSA       .1002224
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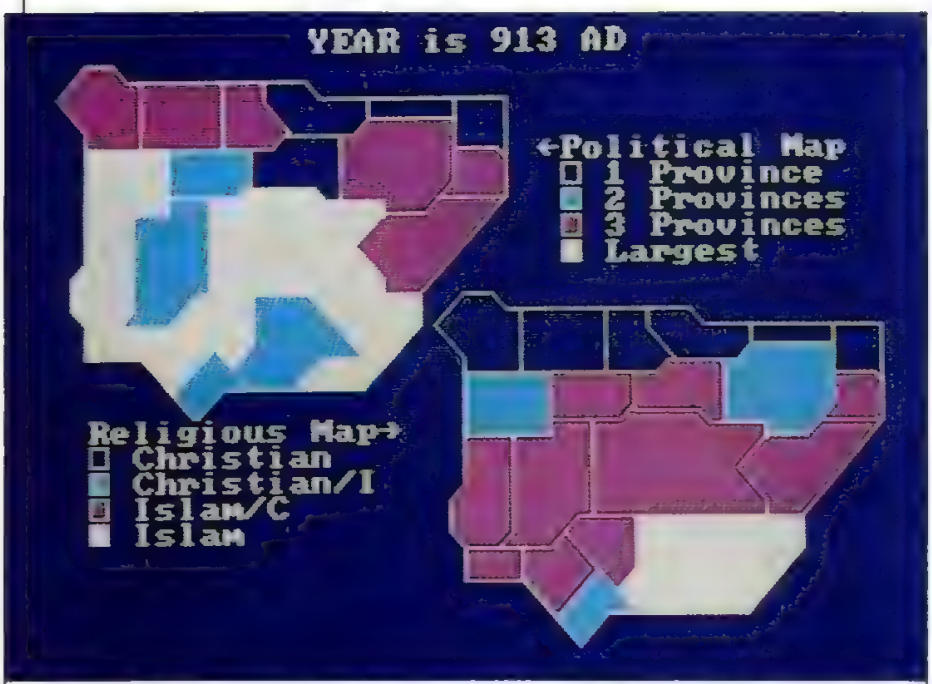


Economic factors accounted for in the model include the production of food, luxury items, and industrial items. Variables include production rates for the last two categories and stockpiles for all three. Eventually these resources are converted into specific finished products; those that equip infantry companies and cavalry squadrons as well as walls, ships, churches, secular regalia, and religious regalia. (Regalia represents the palaces and personal property of the ruling class.) Though churches, as religious edifices of either Christianity or Islam, have no military value, they form an important category on which surplus and not-so-surplus money is spent. Infantry and cavalry represent standing military units paid for by the state. Walls indicate the presence of protected cities and defensive border castles, which directly affect the province's ability to resist enemy attack.

There are two major cultural influences noted: Christianity and Berber/Islam. The numeral 1 indicates Christian-influence province, the numeral 2 Berber influence. Thus, 11 would designate a province that is purely Christian and 22 one that is purely Berber. Either combination of the two digits (12 or 21) indicates cultural diversity within a province.

ONE OF Hueston's stickiest problems was maximization of RAM space.

The last line of the display shows how each province has utilized its land, with decimal values indicating the number of people living by farming and how efficient they are as producers.



After displaying the reports for the year on the monochrome monitor, the program updates the maps, which are displayed on the color monitor. The top map shows which provinces have conquered others. The white area shows the largest conquered area, in this case, the provinces with Cordoba as their Suzereign. The lower map shows the religious status of the provinces—whether Christian, Moslem, or a mixed culture.

Combined with printouts for diplomatic missions, wars, raids, and civil wars, the salient features of the era are continuously displayed on the monitor.

Overcoming Obstacles

During the model's developmental phase, Hueston was able to keep a running check of the data as it ran through the program by organizing the information with labels. But the need for further refinement soon became apparent. "While the information was of great interest for checking the historical accuracy of the model, I found that I just couldn't visualize what was happening. To correct this fault, I needed a map I could look at which could be drawn and updated as needed," he recalls.

The solution was to use a color/graphics adapter and a color television in addition to the monochrome monitor used for the data display. After the computer outputs the data for a year in the model, the text on the monochrome output is redirected to the color/graphics adapter and the color monitor. Using several lines of DRAW commands, Hueston created a pair of rough maps of Spain and its 22 provinces on the color monitor. PAINT commands allowed him to vary the color to show political affiliations of the provinces on one map; the other showed the religion of each province.

"The return to the mono display simply left the color display alone, giving me a chance to study the map at my leisure while the program continued for another year," he adds.

The program itself employs few special commands, with much of the work accomplished with FOR NEXT loops and IF THEN ELSE commands. But because the loops are nestled within each other, simply keeping track of which loops the program was in was a difficult task, he concedes. "The ability to nest IF THEN ELSE commands helped immensely. Many programming lines were saved by using these commands to resolve on one line what would have otherwise filled several lines. And although speed was relatively unimportant to me, these nested commands improved the program's run time as well."

Hueston says the program requires only a small portion of the IBM's power, yet commands such as TRON, TROFF, and AUTO helped in writing the program, as did the ability to edit both on the screen and with the EDIT command to correct inevitable errors.

During the writing, as the database expanded, Hueston found that one of his stickiest problems was maximization of RAM space. "My initial database was entered primarily with READ DATA commands, and, out of the total 690 program lines, the data constituted more than 70. To get around this problem and to pre-

serve as much of the RAM space as I could, I used a CHAIN command. Combining this with MERGE, ALL, and DELETE commands, I made an original program that I used merely to enter my data. I then MERGED the rest of my program, carried over all my data with the ALL command, and then DELETED the lines of the original program. The RAM savings," he asserts, "were impressive."

RAM space was also the victim of frequent conversion of numbers from integer to single precision form. Originally, Hueston fed data in as integers and then manipulated them as single precision numbers. He discovered, however, that 1K was lost during the first pass of the model when all of the integer inputs were converted into the single precision form. "After converting the database values to single precision, the loss disappeared," he later learned. He then searched the program for logical and numeric operations that caused the variables to change from integers to single precision and modified them to remain as single precision. "These two simple changes freed over 1K and reduced the RAM losses during operation to almost zero," he says.

Besides the technical problems that needed attention, historical accuracy had to be maintained with some creative programming as well. "I'd put some data in, run it, and then look at the results. If things weren't working out quite right at the end, I'd change the database until it was right. I had a lot of fingers flying on the keyboard as I tried to decide what factor was doing what to what—not just in one year, but in all the years down the road."

HISTORICAL accuracy had to be maintained with some creative programming.

An Emerging Picture

Using a variety of reference works, he was able to draw a broad historical overview of the period. In the year 900, the country suffered from dispersed authority of the various Moorish emirs who ruled the land. The largest domain was the Emirate of Cordoba, ruled by Abdullah, who was forced to cope with almost continuous civil wars. But his death in 912 brought his grandson Abd-ar-Rahman III to the throne and (in Hueston's view) altered the course of Spanish history. "Under his wise and forceful leadership, the emirate expanded to include all of Spain, except for the far north, which he demanded tribute from."

Because the model looks at historical potentials and mixes the variables in random ways, Hueston had to be assured that the computer wouldn't bring Abd-ar-Rahman to an untimely death. Historically, this Moslem caliph ruled until 961; unless the model was preprogrammed, this ruler could be killed any time the computer decided his number was up. To guarantee his considerable influence enough time to flourish, he was preprogrammed to live at least until 950. After that, he was at the mercy of microcomputer fate.

Among his accomplishments, Abd-ar-Rahman established a central power base and turned Spain into a caliphate. As emir, Hueston explains, Abd-ar-Rahman held only political power; as a Moslem caliph, he headed the state religion as well.

His son and successor, however, proved too weak to maintain the centralized authority, and northern Christian states splintered off from the caliphate and appointed their own governors.

It wasn't until the rule of Almanzor the Conqueror that the disintegration of the centralized government was reversed. "He set about re-establishing the Cordoban ascendancy in Spain," Hueston relates. "Every independent province was attacked, burned, and forced to submit. With fire and the sword, Islam ruled all."

Yet, when Hisham, a descendent of Abd-ar-Rahman, succeeded Almanzor after his death, the country collapsed into chaos once again, and within 30 years the ailing caliphate was officially disbanded. This downfall allowed northern Christians to conquer much of central Spain. Yet before this happened, history records an almost century-long period of dormancy by the Christians. Hueston tried to find a way to represent this situation in his model without having the Christian population reach the point of extinction in a typical run of the program. To assure that they weathered the dominance of the Moslem states, Hueston periodically "rigged" his model with population resurgences by the Christians.

To assure that the Christian states then reached their historic level of aggressiveness at the appropriate time, Hueston arranged for surpluses in their population. "It turned out to be quite easy. I simply depopulated the Christian provinces in the original database and allowed for a high birth rate. Throughout the tenth century, these states expended their excess manpower in repopulating neighboring lands. In the early years of the eleventh century, when, historically, the caliphate collapsed, the final repopulation occurred and the excess population had to conquer new lands or starve. A wave of conquest swept over the middle of Spain."

Typically, in Hueston's program, the relative strength or weakness of the

The detailed province information on Cordoba for the years 913 and 931.

913 A.D.

```
Province CORDOBA AGG 6.236996 MAR 1.1
Ruler ZZ RCS 7.4 RCP 9.1
 283.8433 FUs, 20.82463 LUs, 0 IUs 1.179026 MPs 218 FAS
 3.038619 Regalia 9.497636E-02 Churches 0 Ships 0 Caravans
 8.848175 Infantry 1.8 Cavalry 0 Warships 4.018278 Walls
% in use under Cultivation .8220001 Land in use 179 Potential land 200
```

931 A.D.

```
Province CORDOBA AGG 7.490344 MAR 1.1
Ruler   RCS 0 RCP 0
 299.6182 FUs, 24.25203 LUs, 12.24624 IUs 2.140777 MPs 240 FAS
 2.712023 Regalia .8403775 Churches 0 Ships 0 Caravans
 2.638989 Infantry .2328754 Cavalry 0 Warships 3.769984 Walls
% in use under Cultivation .8040003 Land in use 193 Potential land 200
```

caliphate during any given year is initially a reflection of the ruler's personality. Yet Hueston found that, according to the history books, after Abd-ar-Rahman died, the resulting decay was slow and nonviolent, despite a comparatively lackluster heir to the throne. After the death of Almanzor, by contrast, the collapse was catastrophic, he points out.

Both to test his theory that historical patterns are influenced by the personalities of key rulers and to maintain the historical validity of his model, Hueston researched the characters of Abd-ar-Rahman and Almanzor. "Abd-ar-Rahman was interested in conquering all of the Iberian peninsula and in building a stable government" he relates. "Almanzor, by contrast, only cared about conquering all of Spain. After conquering a province, both would install governors who matched their own personalities. Thus, Abd-ar-Rahman left behind a peaceful state content with itself, while Almanzor left behind a collection of aggressive, acquisitive governors."

Another major programming problem was inducing the individual provinces to attack each other, a rather common occurrence in Spain during the tenth century. "If I set about trying to define all the situations that could bring this about, I would have filled a lot of programming space,"

IN HUESTON'S program, the relative strength or weakness of the caliphate during any given year is initially a reflection of the ruler's personality.

Hueston explains, adding that he took the opposite tack instead. "I assumed that every province always wanted to attack other provinces." To control this, the model lets an individual province randomly select one of the other 21 provinces to attack, but it then begins to consider various limiting factors. "Inactive governors conduct few raids; geographical considerations eliminate many potential attacks; peaceful leaders or simply friendliness between two provinces also can cancel attacks."

With these limitations, the model assumes attacks can occur at any time, but it won't allow them unless the necessary historical conditions exist.

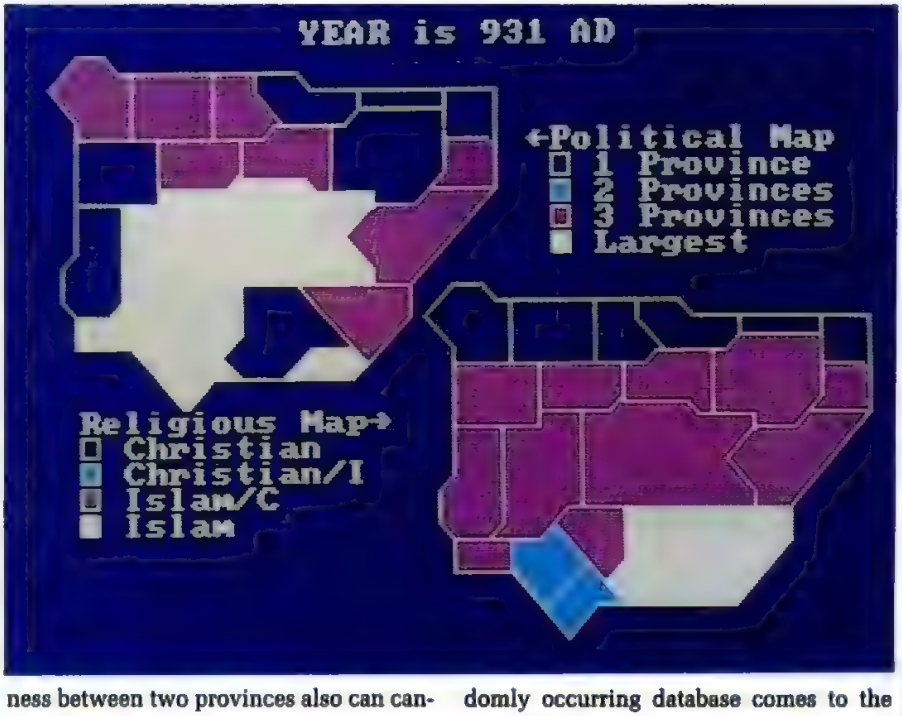
Run with these modifications, the randomly occurring database comes to the year 1080, the time in history when the Almoravids, a fanatical Moslem sect from North Africa, swept across Spain and stopped the advancing Christians from the north. This event punctuates the end of Hueston's model.

These printouts and maps show selections from the events of the year 931 in the Spain simulation.

```
                YEAR is 931 AD                                    28663
Ruler of ALMERIA Died 10      CW: RCS 4.735068 RCP 3.173758

NAVARRE ACA 2.923866 + 0 CASTILE DCA 5.543019
CASTILE is not Conquered by NAVARRE
   Invasion by CATALONIA Against SARAGOSSA is Cancelled
SARAGOSSA ACA 5.840818 + 0 TARRAGONA DCA 14.17308
TARRAGONA is not Conquered by SARAGOSSA
TARRAGONA ACA 4.095074 + 0 SARAGOSSA DCA 9.993711
SARAGOSSA is not Conquered by TARRAGONA
LISBON ACA 3.258089 + 0 COIMBRA DCA 9.380776
COIMBRA is not Conquered by LISBON
There is a Civil War in CORDOBA              Resolved
                Ruler of CORDOBA Dies
GRANADA ACA 8.793805 + 0 CORDOBA DCA 7.183539
                GRANADA Defeats CORDOBA
CORDOBA is not Conquered by GRANADA
                SEVILLE Successfully Raids into MALAGA
                Leader of MALAGA Dies
CORDOBA Repels a Raid by MALAGA

LEON is Suzereign of: GALLICIA,CASTILE,SEGOVIA,OSMA,
NAVARRE is Suzereign of:
ARAGON is Suzereign of:
CATALONIA is Suzereign of:
COIMBRA is Suzereign of:
SARAGOSSA is Suzereign of:
TARRAGONA is Suzereign of: VALENCIA,MURCIA,
LISBON is Suzereign of:
CORDOBA is Suzereign of: BADAJOZ,TOLEDO,ALGARVE,SEVILLE,MALAGA,ALMERIA,
GRANADA is Suzereign of:
```

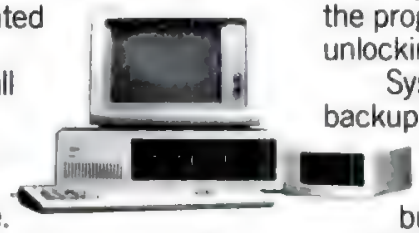


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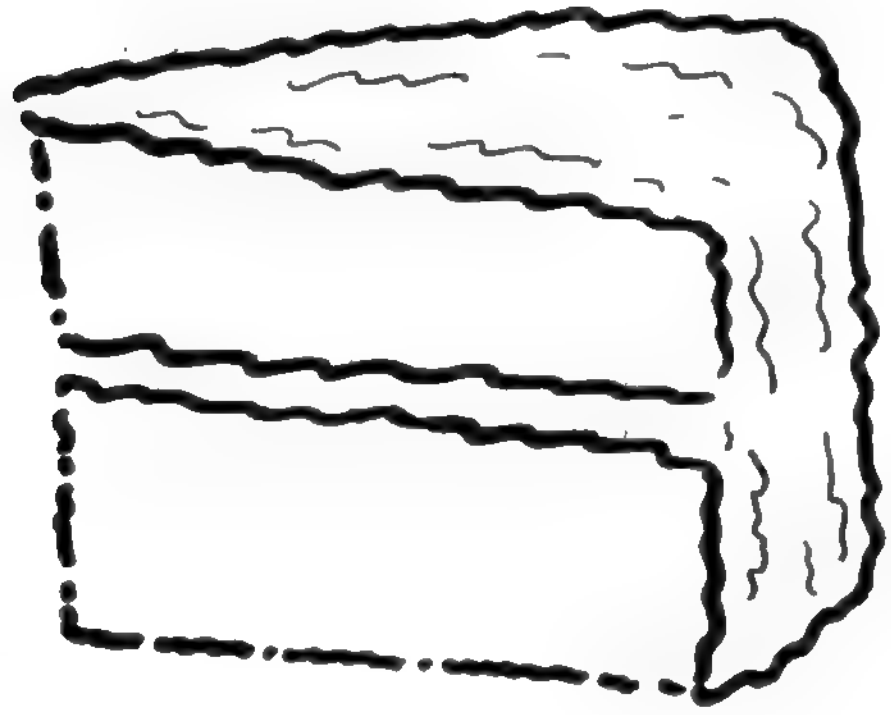
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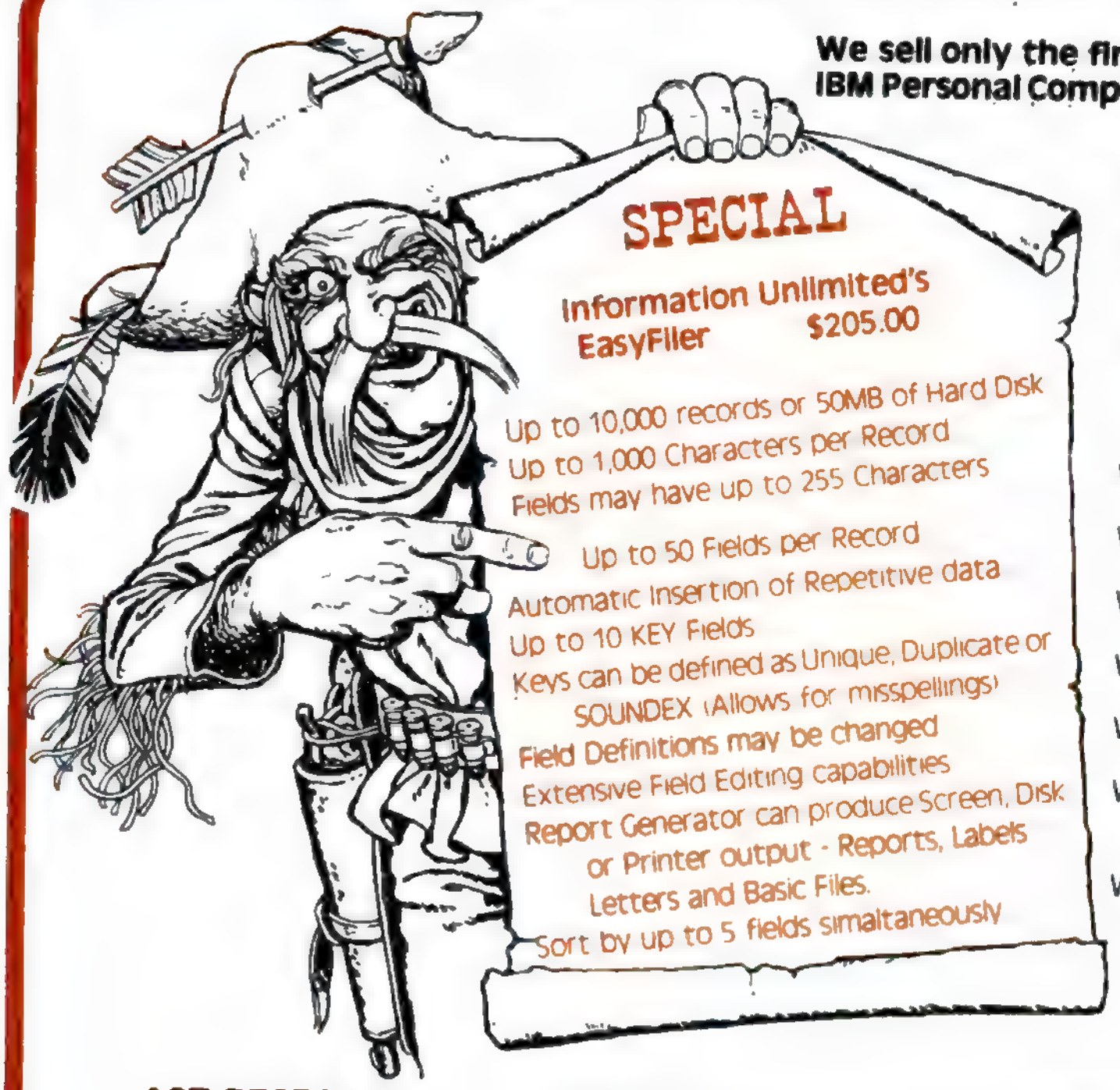
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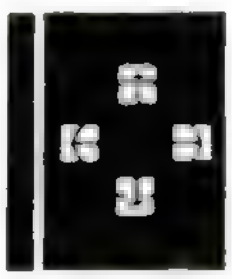
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An Eye To The Future

"I don't mean to suggest that every real war and campaign is represented in the model. I only mean that over a long period of time, the historical forces directed by key individuals will produce realities similar to what history teaches," Hueston explains.

Though no concrete applications have yet been developed for the model, it has helped to interest a Redmond, Washington, software publisher in producing a historically based Civil War game that Hueston wrote. His next major undertaking will be writing a model of Europe from 800 to 1100, an admittedly ambitious project, but one he nevertheless feels he can accomplish on his own. After that, he hopes to have his nonprofit organization operating as a library for historical models, a licensing house for programs, and a place where programmers and researchers will devise psycho-philosophic models to cover the years 1100 to 1900 in century increments. The twentieth century would then be modelled in decade-long installments leading to the present and providing the basis for forecasting tools for future decades.

ABD-AR-RAHMAN left behind a peaceful state while Almanzor left behind a collection of aggressive, acquisitive governors.

"I'd ultimately like to see the government use these predictions to get a better idea about how to handle foreign policy for the next 10 years," Hueston says. "Currently, there are economic models used by government planners. I'm trying to do the same thing with historical models. Maybe we can predict whether the Soviet Union will want to go to war in the next 6 years, for example."

At that point, he concedes, the outcome of theoretical history will depend on more than the random mixture of Steve Hueston's imagination and an IBM PC.

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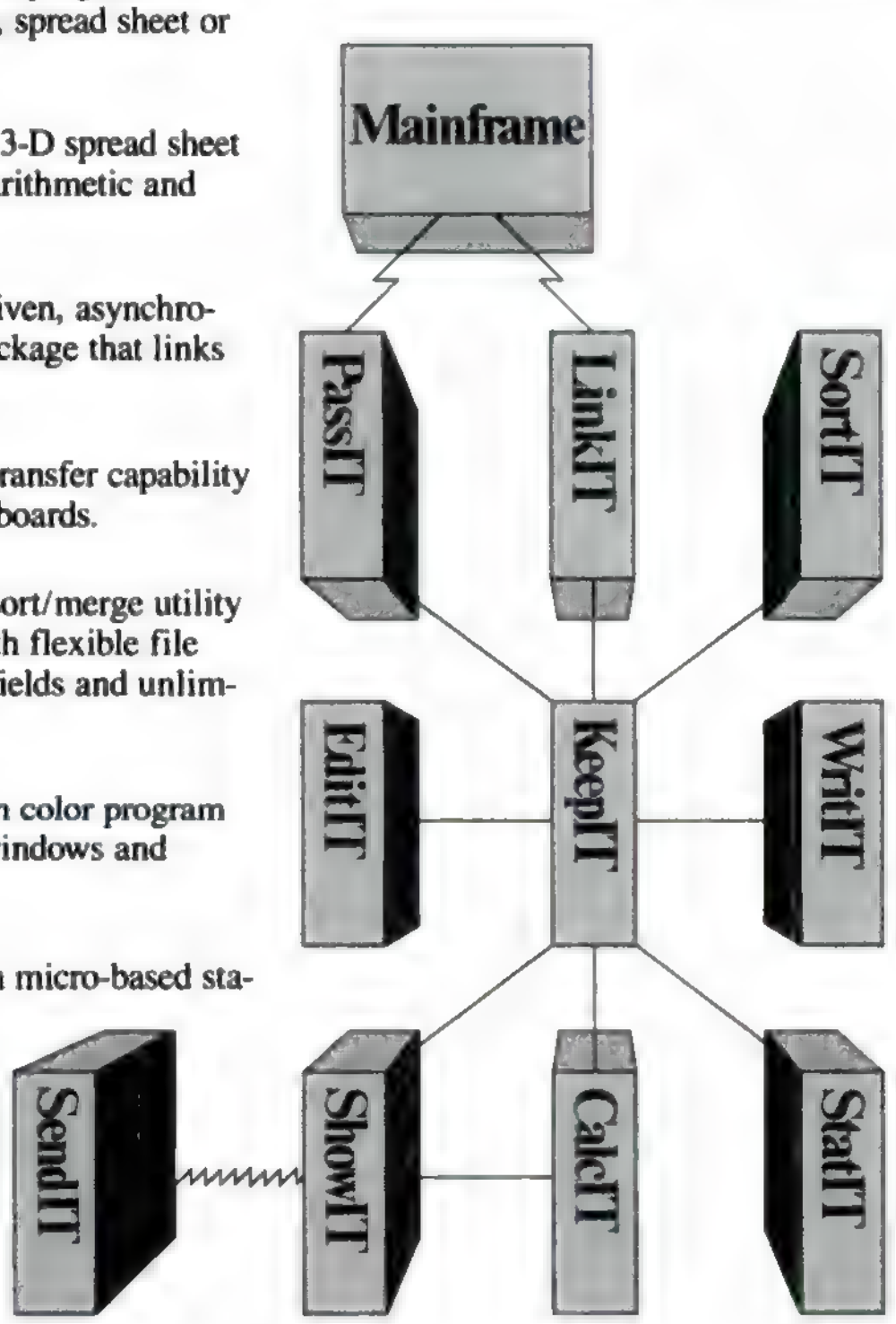
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DATAFLEX vs. BASIC

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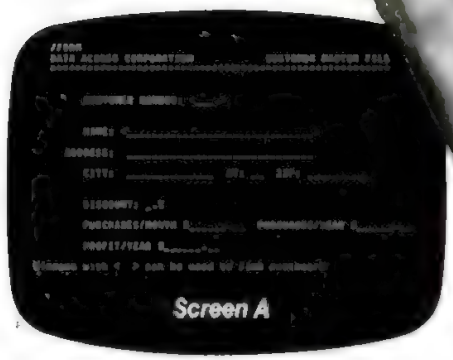
It takes over 350 lines of BASIC code to attain the same results as a single page DataFlex application,* and, for many DataFlex applications, you don't have to know a thing about programming!

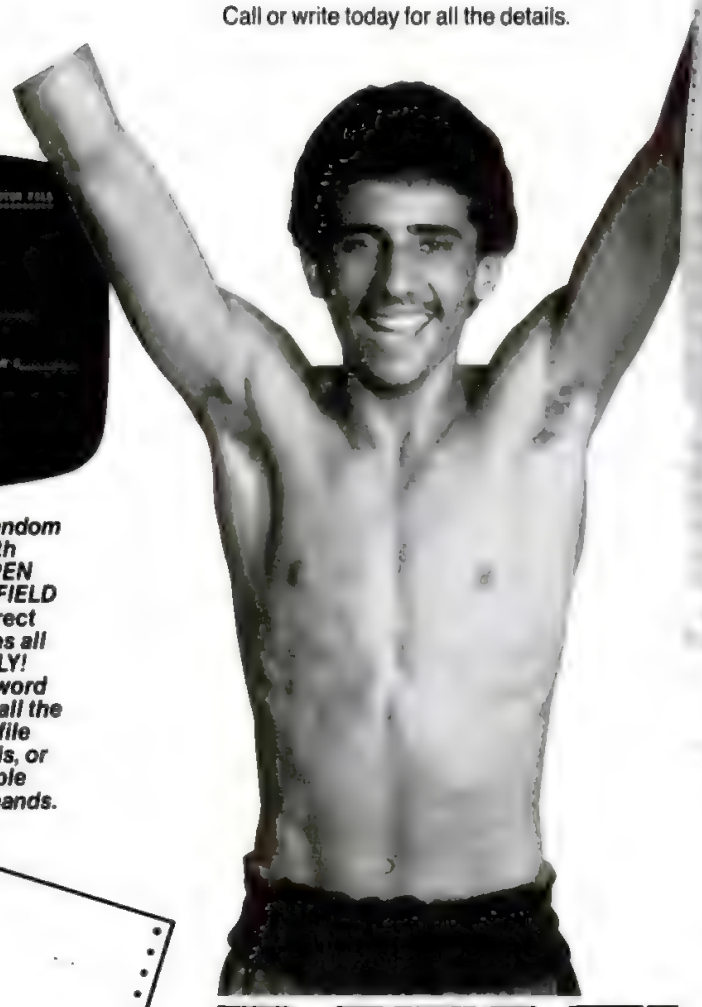
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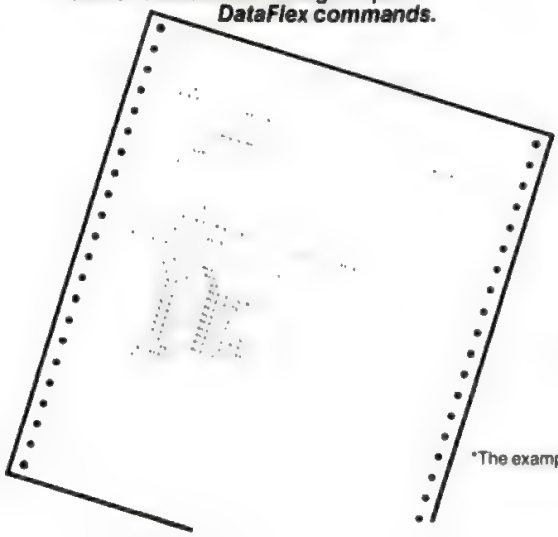
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*The example program is for adding, finding, deleting, and editing data fields in a typical customer database.

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Digital recording and programmable synthesizers owe their existence to the Musical Instrument Digital Interface, which may well be the "found chord" of modern, computerized music making.

Making Music With The Well-Synthesized PC



At last, there's a really important use for the IBM PC: making music.

Databases aren't important. Electronic spreadsheets aren't important. Neither are modems, commnets, hard disks, printer buffers, or *Donkey Kong*. None of the hardware or miles of programming code that have dazzled the world have any meaning at all, in and of themselves.

As truths go, this one is far too easily overlooked: the quality of life can't be measured by listing the tools at our disposal. It's what we do with those tools that counts.

Not that there's anything wrong with using computers for accounting and filing and one-upping your friends. These are tasks that micros are admirably suited for. But when historians look back at our shiny new world of CRTs, operating systems, and language-unfriendly jargon, they're going to be interested in how our computers changed us, not our accounts receivable. They'll study our novelists and playwrights, our artists, our designers, and our architects. Most of all, they'll study our musicians, since music is both the most emotional and scientific of the arts, with twin roots in our hearts and the pure mathematics of sound.



Photograph by Dennis Bettencourt
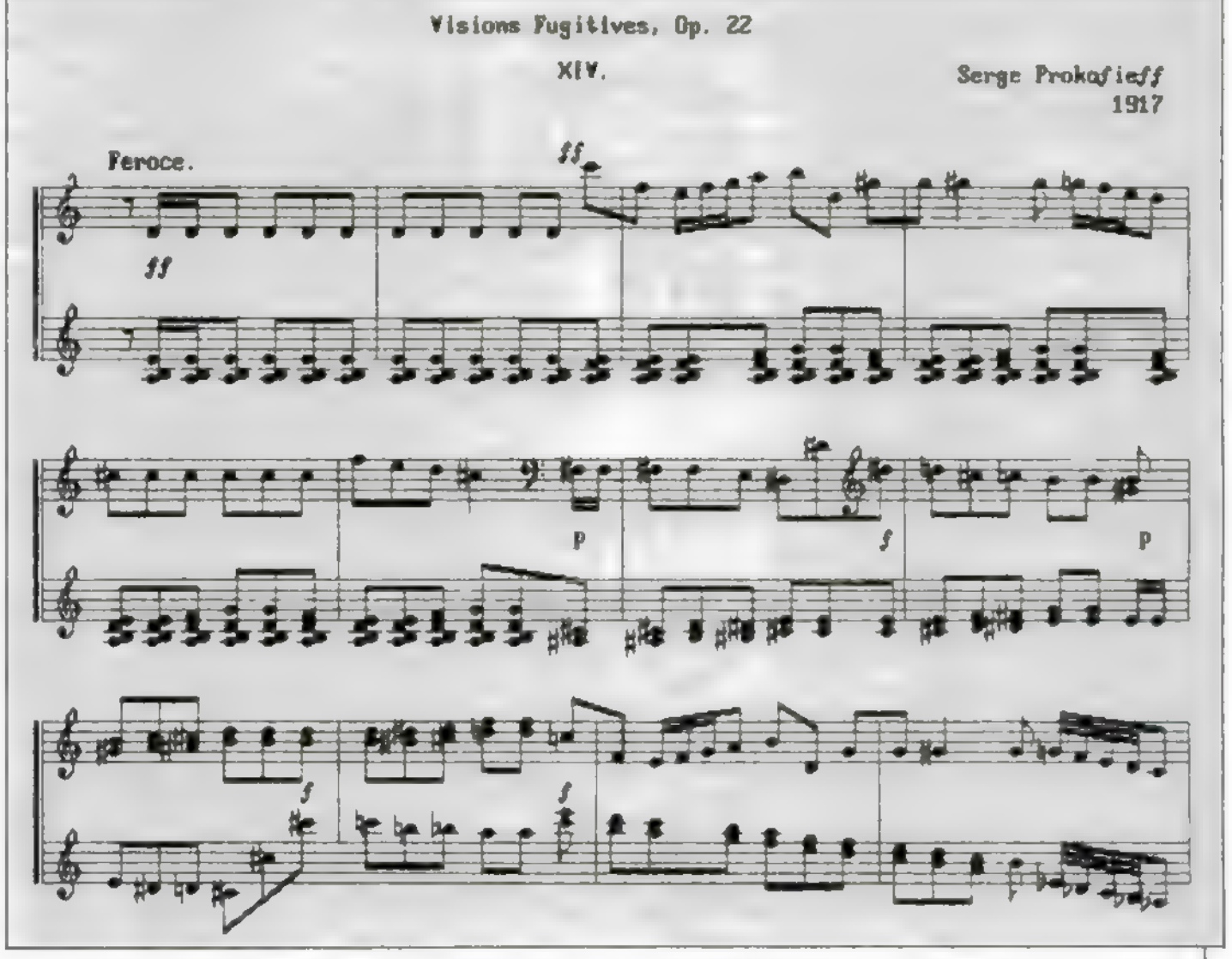
Amazing things are afoot in the world of music. Computer technology has triggered several quiet (and not-so-quiet) revolutions, such as digital recording, programmable synthesizers, and the ubiquitous home computer, all of which are coming together at last because of a new development called MIDI: the Musical Instrument Digital Interface. And the impact of MIDI on music making and education promises to be as far-reaching as the invention of movable type was on literature.

Bob Moog, creator of the first commercially marketed synthesizer, sums it up plainly: "The personal computer is going to be the greatest tool and friend a musician has ever had."

That's your IBM PC he's talking about. There's an incredible wave of software and hardware development by the makers of today's electronic instruments, more for the PC than for any other microcomputer system, and the majority of these products will enter the marketplace from now to next spring.

When the historians look back, there's going to be a lot to see.

This musical score was notated using the screen editing functions of Jim Miller's Personal Composer *software, then was printed by an Epson FX-80.*



Technology Con Brio

Music and technology always have walked hand in hand. The first forged metal was beaten into flutes as well as swords; the great violins of Stradivarius owe as much to secret chemistries of glue and varnish as they do to woodcarving; and the common piano is a virtuoso piece of stress engineering (there are 18 tons of pull in those strings!). It's not surprising, then, that as electronics developed in this century, it found expression in a family of electrified older instruments—guitars, basses, organs—and led to the invention of a new concept, the synthesizer.

AS ELECTRONICS developed, it found expression in a family of electrified older instruments—and led to the synthesizer.

It was only 15 years ago, in 1968, that Wendy Carlos brought the synthesizer out of obscurity with her phenomenally successful *Switched-On Bach*. The instrument was a curiosity, then. Now it's commonplace, thanks largely to the continuing development of the technology that spawned it. Advances in electronics have made the synthesizer more powerful, more portable, more controllable, and above all else, more affordable.

One of those advances was the use of microprocessors, which made the synthesizer programmable.

That was the first computer-based revolution in commonly available musical instruments. Today, more than 90 percent of all electronic keyboards sold, including many home organs, process keyboard information digitally. Some instruments have even gone completely digital, and most others use some hybrid mix of digital and analog circuitry. A good example is one of the most popular of the new breed of synthesizers, the Voyetra Eight, which has dedicated 32K of ROM to its operating system—more than 2½ times the size of the PC's.

The second revolution came with the advent of "sampling," another name for digital recording. This isn't just a means for high-fidelity reproduction of sound, as in today's crop of laser-read compact disks. It is also a major new synthesis tool. Record the sound of a violin into one of the new sampling keyboards and suddenly an entire string section, vibrantly alive, is available under your fingertips. You also can alter and edit natural sounds in a variety of ways, depending on the sophistication of the system, or use a highly unusual sound as your starting point. The limits are only those of your imagination, and you can be serious or silly. If, for some perverse reason, you have wondered what Beethoven's Fifth Symphony would sound like if howled by dogs, all you have to do to find out is sample one howling dog and then play. ("Roll over, Beethoven," indeed.) Sampling also has revolutionized the role of drums in music; more than one hit single in the last 2 years has had no live drummer at all—just the solid, dependable thwack of a digitally recorded drumkit, programmed with any one of several different lap-sized digital drum machines.

The MIDI and the Micro

And now, there's the most recent and most exciting of the little revolutions in

the field, the MIDI (see sidebar, "If You Knew MIDI"). With more and more instruments depending on microprocessors, it was inevitable that manufacturers would try to increase musical power by making the computer in one instrument work in tandem with the computer in another, or with the computer on your desk at home. MIDI makes it possible.

MIDI-equipped keyboards were exhibited for the first time this past summer, by a handful of companies, at the National Association of Music Merchants (NAMM) show in Chicago. The reaction was immediate and powerful. By fall, virtually every firm in the field had entered the arena with plans to include MIDI in all future instruments. Some even offered to add it to their older instruments as a retrofit. And all of them began furiously writing or commissioning software for the major home computers.

What follows can't possibly be comprehensive, and it is liable to change abruptly; when sudden storms hit, just where things will land isn't entirely predictable. But one thing is clear. The IBM PC is the overwhelming first choice for computer/synthesizer linkages, according to the manufacturers of electronic keyboards contacted for this article. More companies are preparing MIDI software for the PC than for any other machine; and wherever development is going on for more than one computer, the PC package has the greater number of features.

Here's some of what is on the way.

The First Note

Small companies can move faster than big ones, making up for financial clout with innovative thinking and the ability to implement ideas quickly. That's a good basic description of New York's Octave-plateau Electronics, Inc., the manufacturer of what is arguably the world's best analog/digital hybrid synthesizer, the Voyetra Eight. The Voyetra showed up at the summer NAMM with a MIDI in the rack-mounted polyphonic synthesizer module; according to Carmine Bonanno, OEI president, the firm intends to ship its first PC-supporting software by the time the winter NAMM is held in January.

When you talk to manufacturers about their MIDI plans, certain things are always mentioned—computer control over synthesizer parameters, enlarged memory for the sequencer (the part that memorizes what you play on the keyboard and allows you to play it back at the press of a button), and multitrack recording. Only the numbers vary, depending on what system configuration for the PC is recommended. The OEI preference is for ½ megabyte of memory, a Hercules graphics card (versions eventually will be released for the Tecmar and Orchid Technologies cards), a Tecmar memory card and printer port, an IBM disk-drive card, and OEI's custom-built MIDI card with eight asynch ports and timers. With this system, you could control several Voyetras at a time and have up to 80,000 notes available in the sequencer's memory. Imagine playing a four-note chord once per second—for 5½ hours. Recording an entire symphony into an instrument becomes possible.

ALL manufacturers are planning to include MIDI in future instruments.

Later releases will include extensive scoring and editing facilities and whatever other special tricks OEI can come up with to make the system more powerful and convenient.

OEI is noted for innovation. A good example is the cable that its MIDI uses. The other systems being marketed require a special ribbon cable and a five-pin DIN plug, but OEI's will use a standard microphone cable with XLR plugs, the ones used throughout the recording field. "XLR cables are state of the art and state of the industry," insists Bonanno. "And they don't break. That's what counts. On stage, if somebody steps on your DIN plug, it's all over."

OEI also is interested in supporting IBM PC compatibles, especially the portables, because the firm feels that offering a musician a machine that can be picked up and taken to work is what it's all about.

Thanks for More Memory

The folks at E-Mu Systems, in Santa Cruz, California, were the first to offer digital sampling, at a less than astronomical cost, in the form of an instrument they called the Emulator. A couple of years have passed since then, and E-Mu still owns the turf (the nearest competition is $5,000 higher and still in the prototype stage to boot). Then, earlier this year,



Emulator from E-mu Systems, Inc.

E-Mu gained even more ground by coming out with a veritable Volkswagen of digital drum machines, the Drumulator, underselling everyone else without significantly compromising quality.

Neither instrument has a MIDI. E-Mu plans to make up for that with plug-in MIDI modules. In the meantime, both can be controlled directly from the PC using software packages that E-Mu is developing. For the Emulator, that means putting a program disk in the instrument's disk drive that, when booted, makes the Emulator's serial port a standard RS232 interface. (Hook it up to any IBM serial card and voila, instant control, as I found out doing the software tests that are described later in this article.)

KURZWEIL'S instrument is based around the powerful Motorola 68000 microprocessor.

The Drumulator/PC package will enable you to write out rhythm notations on your PC's monitor screen, with incredibly complete and precise control over the instrument's digitally recorded drum sounds, accents, time changes, and more. Also, of course, memory space will be extremely expanded.

Kurzweil is a dark horse in the sweepstakes to build the better sampler, and is the E-Mu competitor at the summer NAMM, mentioned above. Kurzweil demonstrated a prototype of its first instrument (currently code-named the Kurzweil 250), and the firm plans to market the instrument and PC support packages together in the first quarter of 1984. Several things make the Kurzweil approach special. One is that the company comes to musical synthesis and sampling from a wholly different discipline, that of pattern recognition and experimental AI (artificial intelligence) techniques. Another reason is that Kurzweil's instrument is the first to be based around the very fast, very powerful Motorola 68000 microprocessor.

Any sampling instrument records a sound by digitizing it. The PC support packages that Kurzweil is hard at work on include the following: spectrum analysis programs, so that sampled waveforms can be displayed, analyzed, and edited; basic uploading, downloading, and storage functions; and a virtual memory system, so that your PC essentially would have an unlimited memory. All you would have to do to keep recording a composition, or play it back without pausing, would be to keep swapping disks.

Eventually the firm hopes to offer orchestration packages that would allow you to write in standard musical notation on the monitor screen and drive the 250 from there.

Another difference in the Kurzweil machine is that its interface to the PC will be through a parallel port, rather than a serial one. The company will be supplying its own proprietary parallel card, unless Kurzweil finds a manufacturer already making one that meets its microprocessor's rather specialized needs.

A Trebled Past

The analog/digital hybrid made by Rhodes, the Chroma, has had a somewhat troubled history. It was originally designed by ARP, one of this country's original synthesizer manufacturers, and was almost deep-sixed before making it to the marketplace when that company went bankrupt. The same conglomerate that owns Fender Guitars, amps, and the famous Rhodes electric piano bought the rights and finished development. It's a fine instrument, and was the first to offer a commercially available home computer interface (to the Apple II Plus). But the MIDI furor caught its parent company by surprise, and just what the results will be



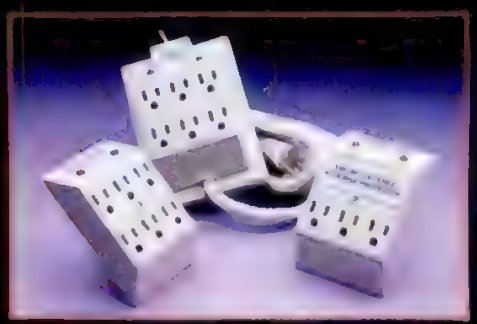
Chroma from Rhodes

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are unknown. The firm has its own interface system, marketed under the name Triad, and the company claims Triad will run MIDI software packages as a subset. But nothing can be pinned down so far, except an avowed intention to stay with software

CBS/FENDER
Rhodes has its own interface system, Triad.

systems that people can customize and write their own modules for.

Tecmar? *Tecmar?* Chalk up another potential product to the list! At Tecmar, executives aren't content with software to link a PC and someone else's synthesizer. Instead, they want to turn the PC into a synthesizer, with peripheral cards and an OEMed keyboard, something like the alphaSyntauri package available for the Apple, but more powerful. Word on just what the system will be is vague, as is the projected release date ("sometime in the early or middle part of next year" was as close as they would get). But they do say that in some respects it will be a purely digital 16-voice synthesizer, and in others it will be a sampling machine—not surprising in light of Tecmar's experience with ADC and DAC cards. They also say that all its RAM will be onboard, so that no system memory will be used for sound generation. This is definitely one to keep posted on.

The musical instrument division of Nippon Gakki, Yamaha, is one subroutine in an international economic construct with $6 billion in assets. Therefore, when Yamaha moves, it moves BIG. It was one of the first companies in on designing the MIDI specifications. And, Yamaha claims that its new line of instruments, the DX7 and DX9 digital keyboards, embodies more of that MIDI protocol than any other company's. Now that the rush is on to match instruments to home computers, Yamaha is examining more than 100 software packages for potential development, licensing, or outright purchase. Some of these are from in-house, some are from outside vendors; all are secrets, and nary a peep is coming from Yamaha's Buena Park, California, offices except that the

If You Knew MIDI

After a complicated birth, this interface has grown up and can now orchestrate a Symphony in PC.

MIDI (Musical Instrument Digital Interface) is actually a technical standard for interfacing synthesizers, drum machines, digital reverbs, and other microprocessor-based musical equipment to one another or to external computers. The advantages to the player are fairly obvious, because it helps prevent the equipment from becoming obsolete and makes it possible to achieve previously impossible effects. The advantage to the manufacturer, of course, is that it makes for more powerful instruments (and is an excellent selling point in a highly competitive marketplace). But just how the MIDI came about and who is responsible for its design is a matter of several split hairs.

It began at the AES (Audio Engineering Society) conference in the fall of 1981, with the presentation of a paper on a "Universal Synthesizer Interface" by Dave Smith, president of Sequential Circuits, Inc., maker of the popular Prophet 5 synthesizer. Response was strong, so Smith opened up talks on the interfacing problem with a variety of other manufacturers. By the January 1982 NAMM (National Association of Music Merchants) show, a loose standard was developing. A meeting there of representatives from 12 American and Japanese companies furthered technical matters. In the spring, the Japanese companies—Roland, Yamaha, Korg, and Kawai—offered an alternative version. Smith and one of his SCI associates, Chet Wood, integrated the two. The word "universal" was dropped for legal reasons and "digital" added to explain the nature of the system.

Thus, more or less, was MIDI born.

Far more important than the particulars of its birth are the implications of its assumption by so many different manufacturers. With it, entire recording and performing systems can be combined into one programmable whole. Synthesizers can be made to play "in parallel" with each other from one or the other's keyboard; entire preprogrammed compositions can be triggered at a touch; it becomes possible for the home computer to be used as the "conductor" of a personal synthesizer "orchestra," and to serve as an unparalleled composing tool; video synthesis can be linked to musical synthesis; and those parts of music education requiring drill, such as ear training and scale recognition, can be automated, freeing a teacher's time to concentrate on a student's technique.

Most important of all, it will change the way musicians and composers *think* creatively. When multitrack recording first began, people would use that to play two or more violin tracks or guitar or keyboard tracks, at once, things that were impossible to play solo. But kids listening at home didn't know what went on in the studio. They just heard something exciting, and went right ahead and figured out ways to play those "impossible" parts—solo. What will come next, from the minds raised on the seemingly unlimited possibilities for composition that MIDI creates?

The adoption of MIDI as a standard has implications for the future of instrument design. If every component of a system can successfully talk to every other component of a system, it creates incentive for specialization. One company might make an extraordinary keyboard, and another, an excellent synthesizer. Why not combine them? The day may come when all a musician will need is one favorite keyboard, guitar, or electronic woodwind (which will be half a computer, if not more); and, no matter the locale, the musician simply plugs that into the club/stadium/studio's MIDI-linked sound-generating hardware, and plays.

For more detail on the structure and functioning of the MIDI protocol, I recommend the article, "MIDI: What It Is, What It Means To You," by Bob Moog, published in the July 1983 issue of "Keyboard" magazine (20605 Lazaneo, Cupertino, CA 95014). Or, order the MIDI specification itself (combined with some applications information) from Sequential Circuits' Customer Service Department, 3051 N. First St., San Jose, CA 95134. Include a check or money order for $10 to cover printing and handling. —F.



Drumulator from E-mu Systems, Inc.

line will be unveiled at the January NAMM show and put into release then or shortly after.

The only safe bet, based on the state of software development for MIDI, is that whatever Yamaha introduces will be extremely formidable.

Big Band-Aid

Personal Composer is a programming masterpiece being developed by a one-man company called Electronic Screen Productions. Beethoven would have killed for this software, even in its current, incomplete form.

Let me backtrack for a moment. Given computerized instruments, there are certain things that everyone wants to do. Multitrack recording is one. Sampling is another. Extremely fine control over synthesis parameters, symphony-length sequences, waveform analysis—everybody mentions these. And they also all mention the two-fold dream.

Dream One—being able to write in orchestral notation on the computer screen and to have that database drive an ensemble of synthesizers.

Dream Two—being able to improvise on a keyboard, or a guitar, and to have whatever you play turned into standard musical notation by the computer.

These are not impossible dreams. Both exist, on mainframe or minicomputer systems well beyond the financial reach of any individual composer (including most rock stars), and MIDI makes them theoretically possible on microcomputers, too. But the instrument manufacturers at work on software say it's extremely tough, and they won't pin themselves down to details and release dates.

Enter the lone, dedicated, and somewhat eccentric programmer, Jim Miller, the sole member of Electronic Screen Productions. He has managed Dream One. He's within hailing distance of managing Dream Two. No matter how you care to look at it, he is at least 6 months to a year ahead of everyone else, if not more, in the development sweepstakes; and his program is truly incredible.

THE MUSICAL software and hardware becoming available for the PC are powerful beyond any precedent.

In a nutshell, *Personal Composer*, a program written in C, is music-processing. To run it you need an IBM PC and DOS 1.1, 256K RAM minimum, a double-sided, double-density drive, and a Hercules graphics board. To control a synthesizer with it will require a MIDI interface, or a synthesizer that will accept input from a standard IBM serial card (an Emulator running its RS232-simulation software did the trick quite handily; and a Drumulator could be connected straight from the serial port, without modification). To print out scores written with the system, you need an Epson FX-80.

I studied the command structure of the incomplete release Miller sent me, tested the functions that were implemented by writing a section from Prokofiev's *Visions Fugitives* onto the computer screen, and grinned from ear to ear when I typed P1 for PLAY and heard the cello and string sounds from the Emulator performing Prokofiev's music. (I grinned even wider when I changed the sounds in the Emulator and played the same music with them. Remember Beethoven's Fifth Symphony as done by howling dogs, mentioned earlier? No less silly was Prokofiev in tuned sneezes.)

Data Bass

Lack of any documentation made *Personal Composer* a bit tough to learn, but then, this wasn't an official release, and Miller was more than helpful stepping me through it over the phone.

The system as it stands works quite simply. By using various keyboard commands, you determine how many musical staves will be visible on the screen, what clefs they will play in (six are available—bass, tenor, alto, soprano, high soprano, and percussion), what time signatures will operate, and what notes and rests you want to place on the staves. Positioning is done with cursor move commands; just set the cursor in the right place, name the note you want, and it is there. It also will automatically be joined to other notes in a group, with a bar at the right slant, if you so specify. You can change the grouping later, by addition or deletion, and the bar redraws itself appropriately. Precision of timing is exquisite—the system can play notes or rests as fast as a 32nd note septuplet played seven on two (translation for the unorchestrated: seven 32nd notes played in the same length of time that two normal 32nd notes would take, according to the selected tempo).

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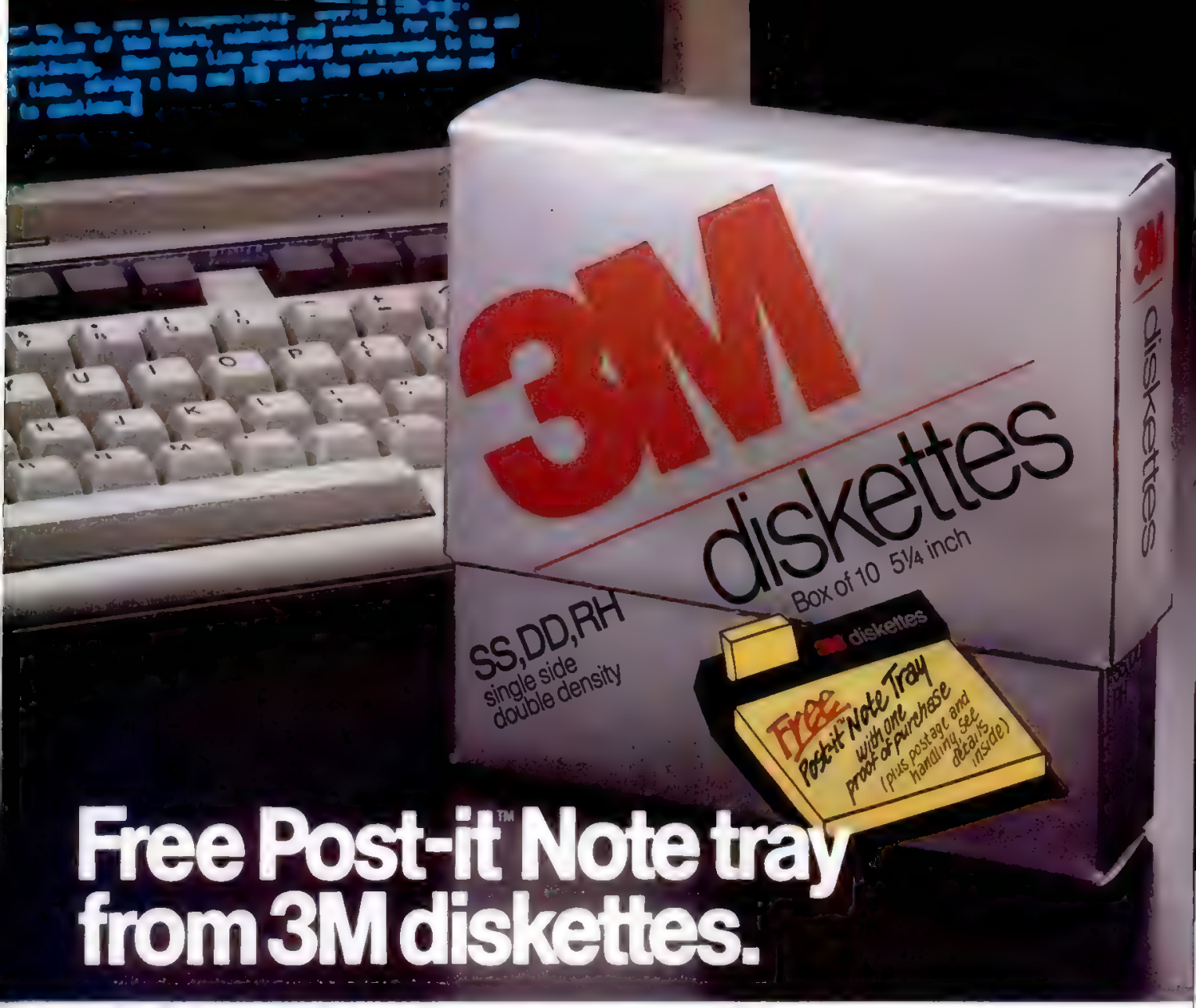
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The precision is almost too great. The way the system handles multiple lines in music is to read bracketed staves from left to right. If you have incorrectly positioned something in one of the clefs by even one cursor move command, then synchronization is completely shot. If there was anything that took a long time to adjust to, it was that. Troubleshooting the score on a note-by-note, measure-by-measure, clef-by-clef basis was a pain. Accordingly, Miller has begun work on a series of self-checking and correcting utilities for the final release package.

Consider the following possibilities:

- Memory space in the system can accommodate scores of orchestral complexity and length.
- The MIDI protocol the system is designed to operate with can control virtually any aspect of a synthesizer or a drum machine, and the final release will access these tricks through standard musical notation. A staccato mark on a note can be used to change, for that one note only, a synthesizer's attack or filtration time, or a synthesized drum roll could be written with each individual snare drum beat at a specifically chosen volume level.
- The system will individually control each synthesizer "voice" in an instrument and more than one instrument at a time. Take the PC described above and use two serial cards, and you can control four Yamaha DX7s and a Drumulator at the same time. That's the equivalent of a 67-piece orchestra!
- The final release will have composing aids like Miller's "chord member indicator." Type in the chord you want, such as an E-minor, and, as you move the cursor up and down a stave, the screen readout

An optimal configuration for the Personal Composer system, designed by Jim Miller.

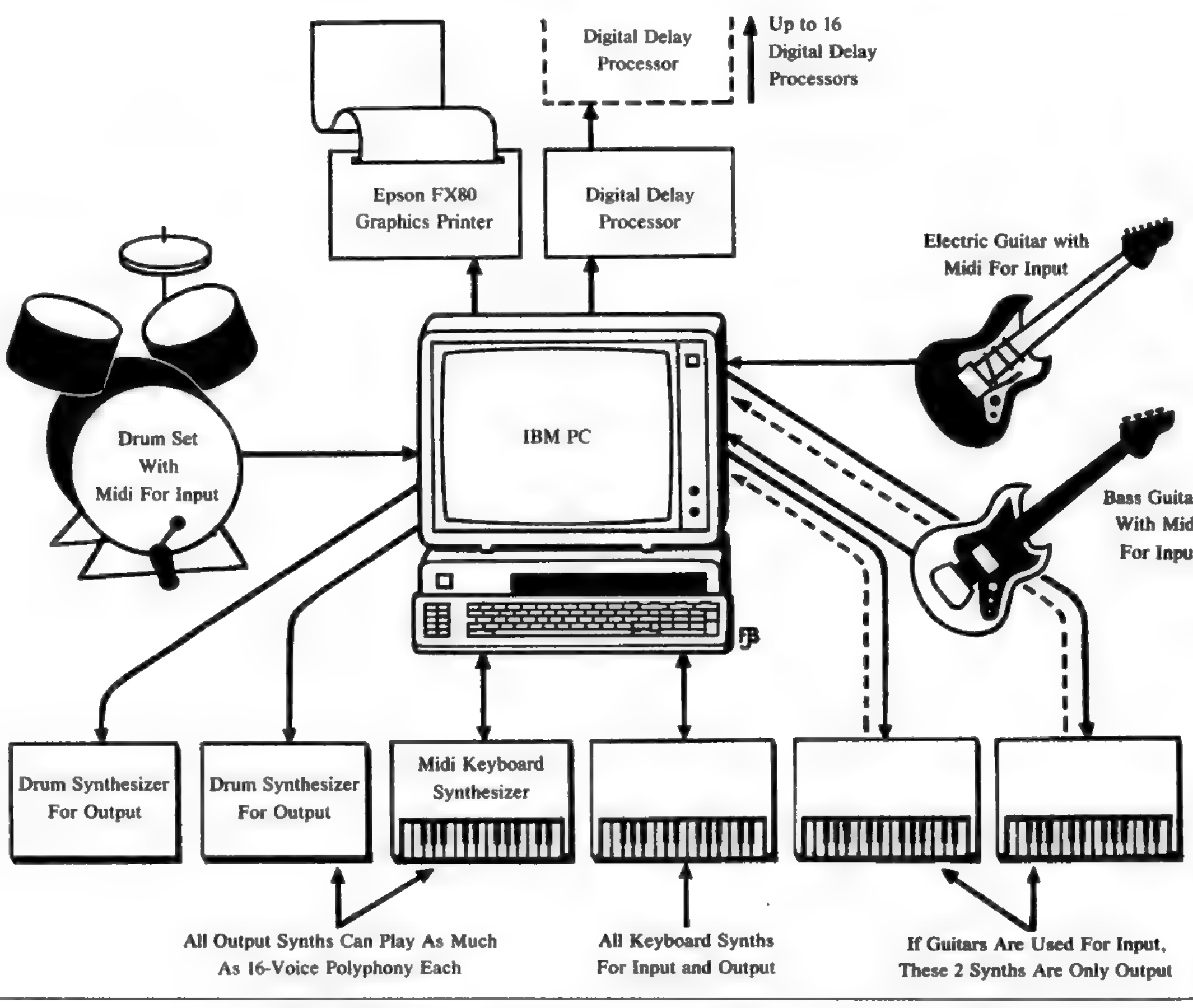


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will tell you what member of the chord you are on. Stop on F-sharp in the treble clef, for example, and it will say "9," because F-sharp is the ninth of the E-minor chord.

A Clef Hanger

There's a lot more to come. Miller is not far from perfecting the version in which you play into the keyboard, and the computer not only records, but also notates. Typically, that isn't enough to content him. His system will take more inputs than one. An entire band could improvise together, and the IBM PC equipped with *Personal Composer* would capture it all.

Just how and when Miller's package will be commercially released is not certain. At press time, the lone programmer was besieged with interest from several different manufacturers, and just which firm will be distributing it is not settled. In the meantime, the promise is there, and the proof as well; if you are interested you should contact Electronic Screen Productions (see sidebar, "Instrument Information").

All I know for certain is that the musical software and hardware becoming commonly available for usage with, or interface to, the IBM PC, are powerful beyond any precedent in the field. And the creative minds out there, the potential Bachs and Stravinskys of our day, are going to find them and make them flower.

Our ears are going to love the future.

/PC

Freff is a professional writer, artist, and musician who lives in Brooklyn with his wife, two cats, and sixty-odd musical instruments. He is a graduate of Ringling Brothers and Barnum and Bailey Clown College, class of '74.

Instrument/Product Information

The following products are mentioned in this article.

Chroma
CBS/Fender Rhodes
1300 E. Valencia Dr.
Fullerton, CA 92634
(714) 879-8080
List Price: $5,499
Description: Synthesizer

Drumulator
E-mu Systems
2815 Chanticleer
Santa Cruz, CA 95062
(408) 476-4424
List Price: $995
Description: Digital drum machine.

DX7 Synthesizer
Yamaha Combo Products
Box 6600
Buena Park, CA 90022
(714) 522-9348
List Price: $1,995
Description: Programmable FM digital synthesizer.

DX9 Synthesizer
Yamaha Combo Products
Box 6600
Buena Park, CA 90022
(714) 522-9348
List Price: $1,395
Description: Programmable FM digital synthesizer.

Emulator
E-mu Systems
2815 Chanticleer,
Santa Cruz, CA 95062
(408) 476-4424
List Price: $7,995
Description: Digital sampling keyboard.

Kurzweil 250
Kurzweil Music Systems
57 Wells Ave at Rt. 128
Newton Center, MA 02159
(617) 244-2121
List Price: n/a
Description: Digital sampling keyboard.

Personal Composer
Jim Miller/Electronic Screen Productions
PO Box 6221
Stanford, CA 94305
List Price: n/a
Description: Software for IBM PC.

Voyetra Eight
OEI (Octave-plateau Electronics, Inc.
928 Broadway
New York, NY 10010
(800) 221-3105
List Price: $5,390.
Description: Polyphonic synthesizer module and VPK-5 keyboard.

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The information in this table is believed to be correct based upon vendor documentation but cannot be guaranteed

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Good news! The Annual PC-Hackers Convention is coming to town, and your company has received the contract to supply a sound reinforcement system for the technical sessions to be held in the municipal auditorium, a rather large (30- by 15-meters), barnlike structure. You hear that last year's show was a disaster. The folks in the back of the hall couldn't hear a thing, while those up front haven't heard anything since.

Your first order of business is to figure out how many loudspeakers to use and where to put them. To help you work it out, speaker manufacturers provide all sorts of information about their professional speakers. If you need to know anything, just ask. Axial sensitivity? Directivity index? Maximum power? It's all there on the spec sheet. All you have to do is figure out what it means, set aside a month or two for calculations, a few days for trial setup sessions, and you should have it all under control. Barring lawsuits from the hackers, you can probably figure out the necessary corrections later on, perhaps in time for next year's convention.

You may think this sounds like an improbable scenario for a professional sound contractor. Not necessarily so. Measuring a room for wall-to-wall sound is a significantly trickier task than fitting it for wall-to-wall carpeting. It's a pretty safe bet that if you order a 30-by-15 rug, it will cover a 30-by-15-foot floor, but what on earth is a 30-by-15 sound system? As any audio pro will tell you, it depends on all sorts of interactive variables. And just to keep things interesting, even the number of people in the room will change the requirements for the sound system.

Most sound contractors eventually learn to cope with the variables and can call upon a little theory and a lot of practice to work out the details of a sound installation. Theory often takes a back seat to practice, simply because the complexity of all those calculations can be awfully time-consuming.

WHAT on earth is a 30-by-15 sound system?

Take the simple matter of installing two speakers, instead of one, when a little extra amplification is needed. The same sound coming from two locations triggers a series of interactions. Some sounds seem louder, while others seem softer, and what

sounds good in one location becomes almost unintelligible in another. Now, add another handful of speakers, and be glad Big Blue is on your side.

Changing the Sound Design Picture

The computer age has not escaped the notice of speaker manufacturers, and it was only a matter of time before one of them turned a PC loose on the problem. Earlier this year, the Professional Products Division of JBL, Inc. announced a seminar for sound contractors. The news release containing the announcement promised that JBL would be "changing the sound design picture" at the seminar.

For sound contractors with a PC and color/graphics capability, the picture is indeed changed. On an IBM PC, in copy-protected, compiled-BASIC code, JBL has presented its *Central Array Design Program (CADP)* for use with an IBM PC. On four disks, the program can perform the following functions:

- Calculate and display the sound pressure levels that may be expected at up to 200 locations within a room;
- Compute the direct-to-reverberant ratios to be found at these same locations within the room;
- Estimate the intelligibility of the sound system throughout the room;
- Draw the front, side, and top view of the array, and indicate its center of gravity.

THE computer age has not escaped the notice of speaker manufacturers.

What's an array? No, it's not what you think, although it is indeed a group of variable elements that are referred to with one name. But, in *CADP*, the element name is always "loudspeaker," and the variables are such things as model number, power rating, mounting location and angle, and all of the other parameters that distinguish one speaker from another. The array consists of as many loudspeaker elements as may be needed to do the job.

Armed with a collection of speaker spec sheets and the *CADP* disks, the sound contractor can spend some time answering all the usual what-if questions before heading for the auditorium with a truckful of heavy hardware, rigger's gear, black coffee, and Excedrin.

Measuring for Sound

CADP initially needs some information about the room in which the sound system will be installed. For example, what does the floor plan look like? Assuming a rectangular room is specified, the program needs to know the Cartesian coordinates of its four corners. Don't panic—that's just the relative length (X),

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Figure 1: The Cartesian (X, Y, Z) coordinates for a level floor with four corners.

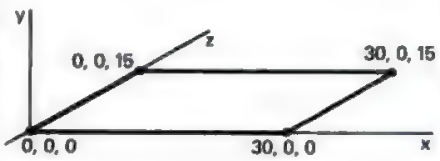
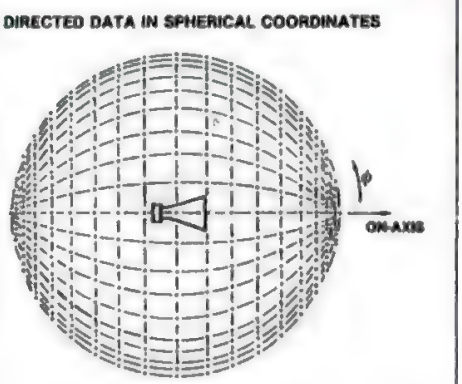
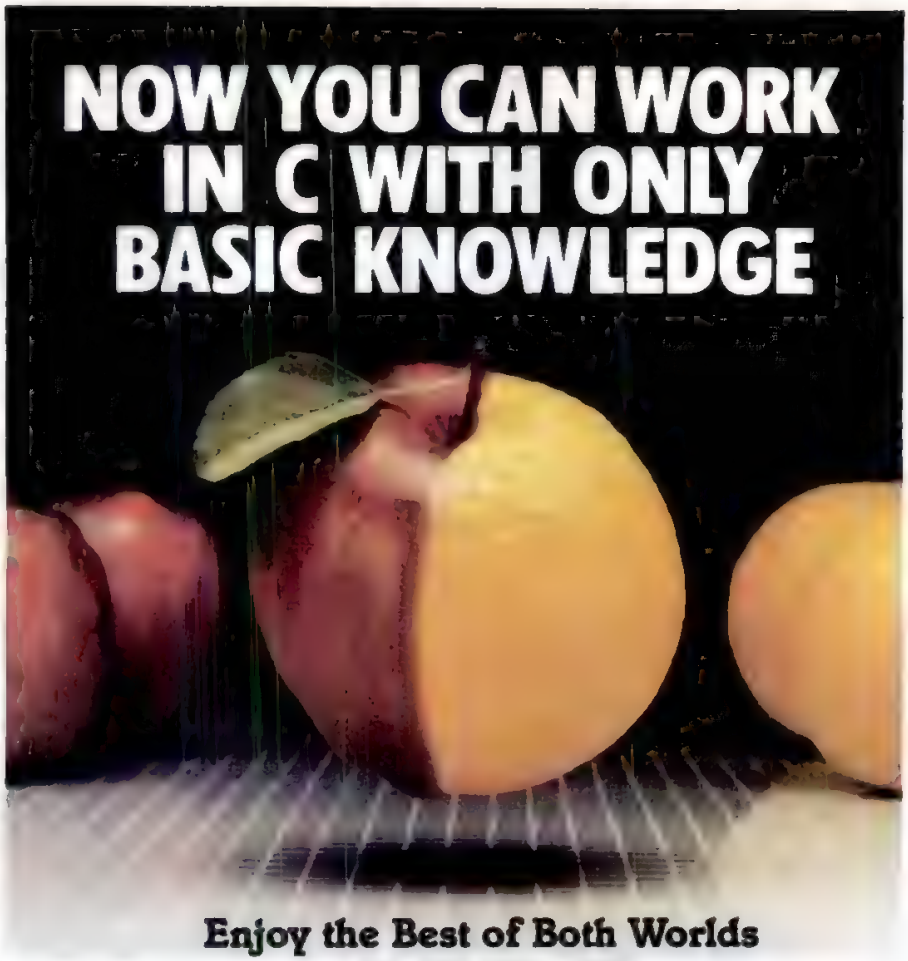


Figure 2: An imaginary sphere surrounding a loudspeaker. For selected JBL loudspeakers, CADP data files give the sound pressure level at various points on the sphere.



height (Y), and width (Z) of each corner, with respect to corner 1, which is assumed to be 0, 0, 0. For a 30-by-15-foot room, corner 2 is given the coordinates 30, 0, 0; corner 3, 30, 0, 15; and corner 4, 0, 0, 15, as seen in Figure 1. Of course, if the room has an angled floor, the Y coordinates at one end of the room—say, corners 2 and 3—will not be zero. But let's keep things simple for now.

Next, you have to specify the room's surface area and volume. With an 11-meter ceiling (yes, it's a big room), these figures are 1,890 square meters and 4,950 cubic meters, respectively. Now comes the hard part. What is the reverberation time? This is the time it takes for the sound pressure level to fall 60 decibels once the sound source in the room is turned off. Most pro sound contractors have the hardware required to measure this. Or, in the case of a room that has not yet been built, the average absorption coefficient of all the room's surfaces may be entered instead. Depending on which of these



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variables is entered, the program will calculate the other and store both of them in its memory.

Bring In the Elements

Now it's time to bring in the elements—that is, the speakers. Instead of driving around to the auditorium, hanging a speaker and then wandering around the room listening to the effect, *CADP* allows you to program a speaker into the room somewhere and then to see what happens on the screen.

For a single speaker, suspended from the ceiling at the front of the room, the Cartesian coordinates are 0, 11, 7.5. In other words, the speaker is 0 meters from the front wall, 11 meters up, and centered. If the speaker's elevation angle is set at about 20 degrees, it would be pointed at the floor in the rear of the room. What happens if you use a JBL2366 speaker under these conditions?

Two of the *CADP* program disks contain polar data files for various JBL low- and high-frequency speakers. This is simply information indicating the relative sound level at various points on an imaginary sphere surrounding the speaker. The sphere is seen in Figure 2, and each file contains data for about 800 points surrounding the speaker.

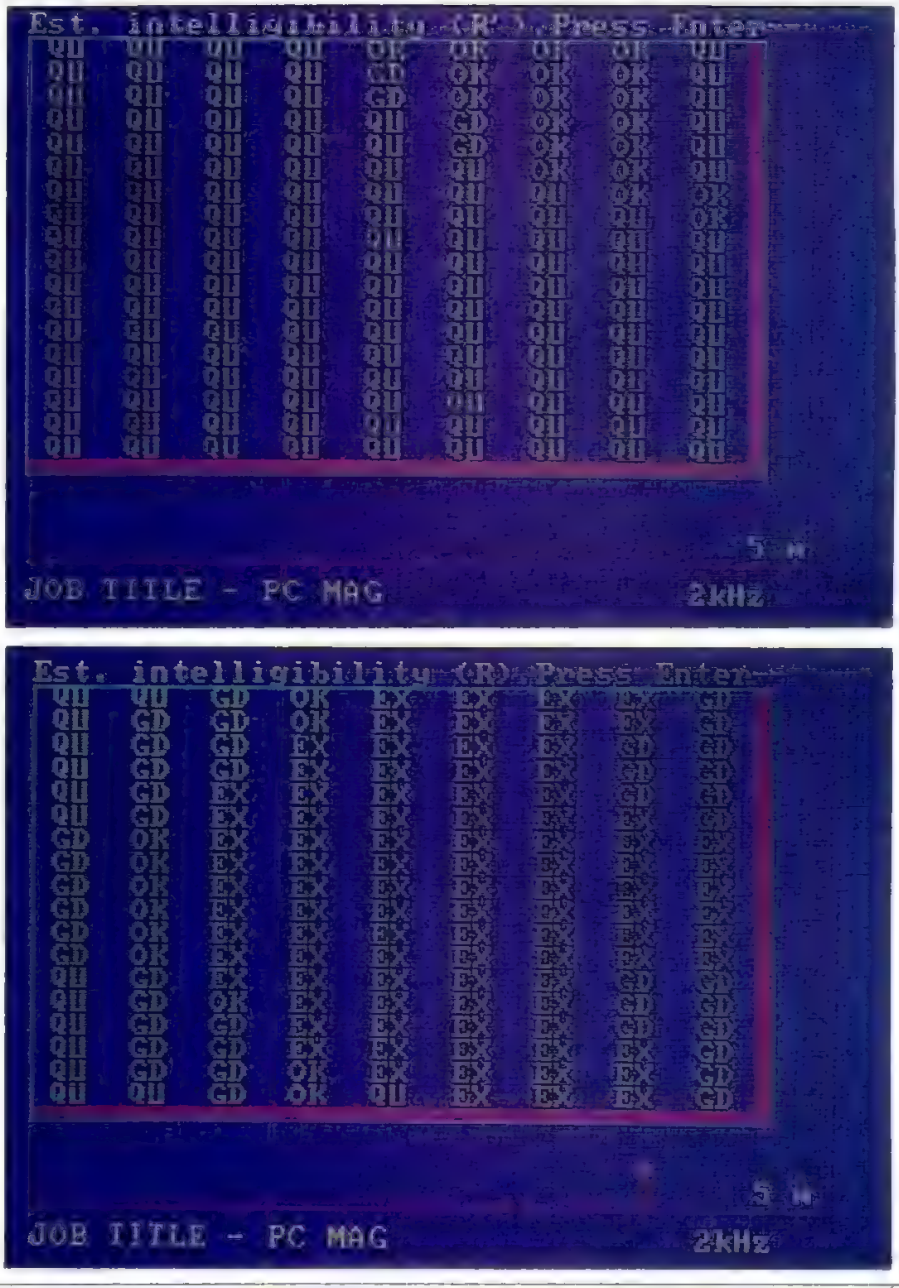
Testing the What-Ifs

With the main *CADP* disk in drive A and the appropriate data file in drive B, you are ready to begin a series of what-if routines. A good place to start would be with a calculation of estimated intelligibility throughout the room. The table displayed on top in Figure 3 doesn't look very promising. It shows that intelligibility is questionable (QU) at most points in the room and good or OK in just a few spots. That's not very encouraging.

But before making any changes, it might not be a bad idea to look at the speaker itself and verify that it is mounted properly.

Aha! Figure 4 is not what you really expected to find. In this topview, the speaker appears to be pointing to the side, rather than down. Apparently, the 20 degrees was added as an azimuth angle, rather than as an elevation. A quick fix is needed, but relax—it's not time to get out the stepladders. Just go to the loudspeaker menu and change the azimuth to 0 and the elevation to −20 degrees. A quick recalculation will produce a noticeable improvement, as seen on the bottom in Figure 3. However, a few questionable areas still remain, so a few more what-if routines are needed.

Figure 3: The table on top, a color graphics display of predicted intelligibility at various points within the room, shows many questionable areas. Beneath it, after correcting the speaker angle, the display shows considerable improvement.

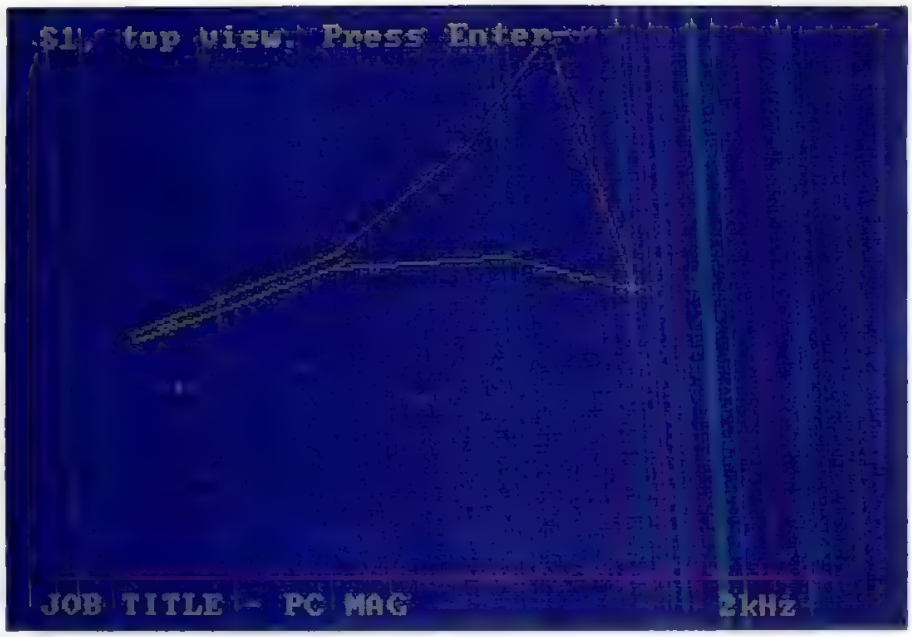


Here's where the pros are separated from the amateurs. The program doesn't offer any hints toward designing the perfect speaker array. There isn't even an iteration routine that will take you through every possible combination until you stumble across one that works. So it's up to you.

If you just want to show off, you can go all the way, trot out seven speakers, and see what happens.

One by one, hang the speakers (on disk only), and play around with location, azimuth, elevation, power level, and such. Just to make sure the speakers aren't pointing at each other, you can go to the mechanical-design menu and display

Figure 4: *This display suggests why intelligibility, primarily, is questionable. By accident, the speaker (as viewed from the top) is pointing at an angle instead of down.*



each speaker separately or the entire cluster at once.

The various speakers are displayed by utilizing data on a disk containing drawing files for each speaker (see Figure 5).

TWO OF the CADP program disks contain information indicating the relative sound level at various points on an imaginary sphere surrounding the speaker.

These files contain a series of X, Y, Z coordinates for as many points as are needed to draw a "follow-the-dots" three-dimensional view of the speaker, as seen in Figure 6. The drawing-file data is manipulated by the main program to display the side, top, and front views of any speaker, or of a cluster of speakers. For example, Figure 7 shows your seven-speaker cluster, more or less as it will look from all three perspectives. Once it all looks reasonable, you again can calculate the intelligibility in the room. Fortunately, the speaker cluster shown in Figure 7 turns out to yield excellent intelligibility throughout the room.

CADP also will calculate the relative sound pressure level at various points within the room. Ideally, there won't be that much variation from one point to another. If there is, then it's "back to the drawing board" for a little more what-if time.

Once you've designed a speaker array that looks promising, *CADP* will save a job file of the basic parameters, as seen in Figure 8. The first line indicates the number of speakers and other data that would be needed for more complex systems. This is followed by seven lines containing data for each of the seven speakers (S1 through S7). The data indicates the orientation of each speaker, its X, Y, Z coordinates, power level, etc. These lines are followed by the acoustic data that pertains to the room (absorption coefficient, reverberation time, surface area, and volume). The five lines of "" seen here are for strings containing job descriptions, headings, or any other information that the designer would like to save in the job file.

Figure 5: *The drawing files contain a series of Cartesian coordinates that the CADP will manipulate to draw isometric projections of each speaker.*

```
-11.5,13.5,0,-11.5,13.5,10.75
-11.5,13.5,10.75,6,13.5,10.75
6,13.5,10.75,6,13.5,0
6,13.5,10.75,6,-17,10.75
-11.5,-17,10.75,-11.5,13.5,10.75
-11.5,-17,0,-11.5,-17,10.75
-11.5,-17,10.75,6,-17,10.75
6,-17,10.75,6,-17,0
-11.5,13.5,0,-11.5,13.5,-10.75
-11.5,13.5,-10.75,6,13.5,-10.75
6,13.5,-10.75,6,13.5,0
6,13.5,-10.75,6,-17,-10.75
-11.5,-17,-10.75,-11.5,13.5,-10.75
-11.5,-17,0,-11.5,-17,-10.75
-11.5,-17,-10.75,6,-17,-10.75
6,-17,-10.75,6,-17,0
6,10,-3,6,10,3
6,10,3,6,6,7
6,6,7,6,1,7
6,1,7,6,-3,3
6,-3,3,6,-3,-3
6,-3,-3,6,1,-7
6,1,-7,6,6,-7
6,6,-7,6,10,-3
```

Once the basic job file has been saved, it's a relatively simple matter to modify the design parameters to suit a variety of situations. For example, what if the room gets redecorated, say with lots of fancy

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Figure 7: Side, top, and front views of a seven-speaker cluster.

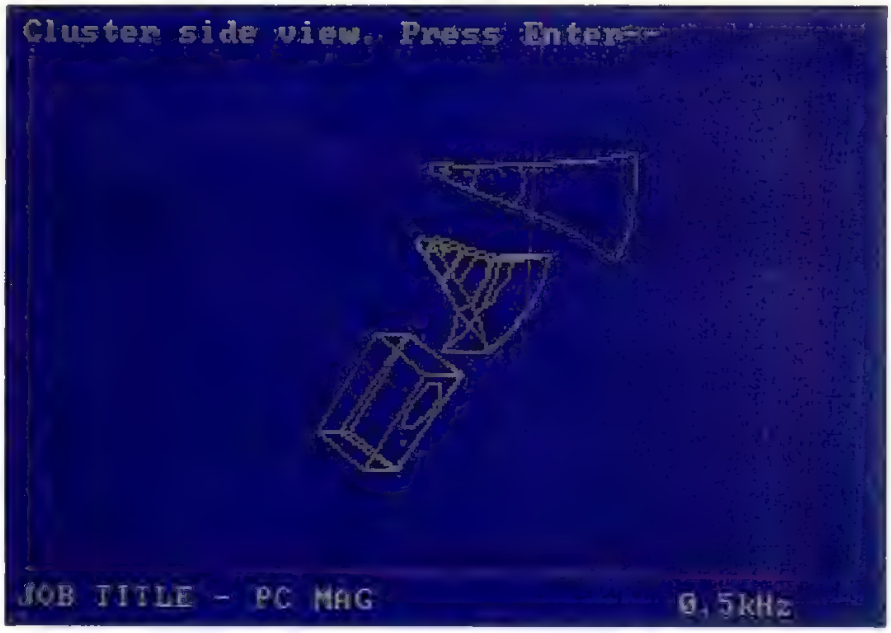
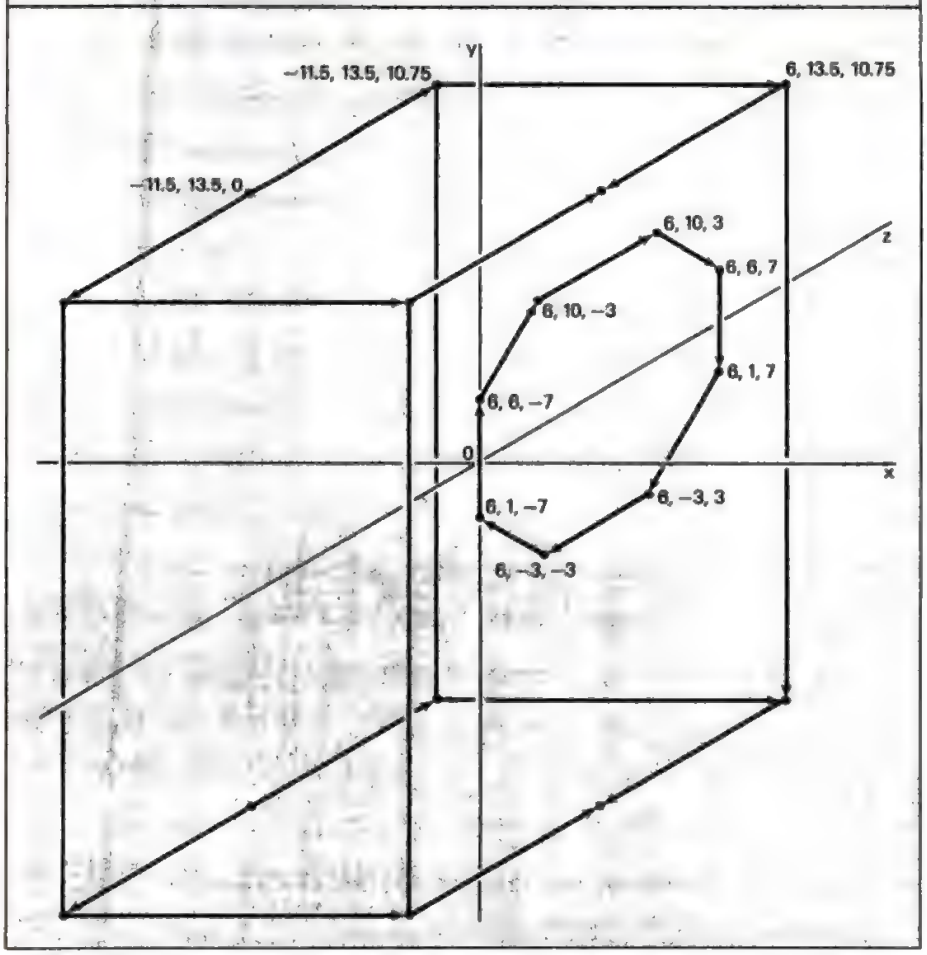
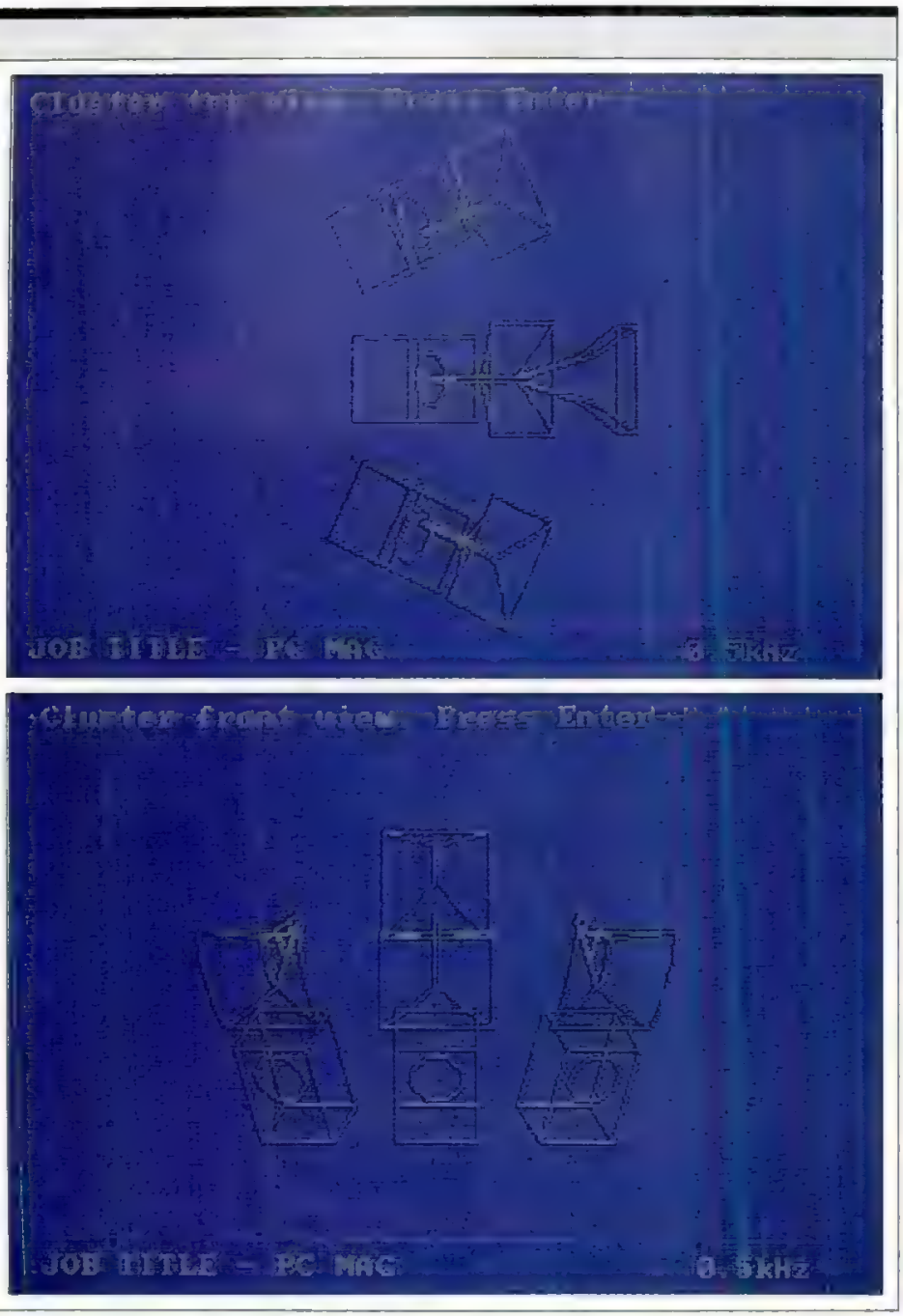


Figure 6: An isometric view of the speaker drawn from files in Figure 5.





mirrors, or perhaps a new carpet and drapes, or anything else that will change its acoustic properties? Or, if only half (or maybe twice) the expected audience shows up, should you turn on fewer or more speakers? Or do you need merely to adjust the amplifier power output?

Most of these questions can be answered by retrieving the job file and making a few changes. For example, one or more speakers can be turned off by changing the appropriate power drive level to "−99." Or you can swap speakers simply by changing a model number in the job file. Later on, *CADP* will find the appropriate speaker's file and use its data for the calculations. This feature is especially convenient for finding out if some new speaker might do a better job than an existing one. It certainly beats going through a whole reinstallation job just to discover there's no audible improvement.

As supplied by JBL, *CADP* contains data on a selection of popular JBL components. In addition, there are utility programs included that allow the sound con-

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Figure 8: The CADP Job File will save system data for review or future modification.

```
7,0,1,0
"S1","JBL2366","0-5",0,0,-10,0,11,7.5,0,5000
"S2","JBL2360","0-5",0,0,-35,0,10.5,7.5,0,5000
"S3","JBL4508","0-5",0,0,-35,-.2,9.5,7.5,0,5000
"S4","JBL4508","0-5",25,0,-35,-.3,9.5,8.5,0,5000
"S5","JBL2360","0-5",25,0,-35,-.1,10.5,8.5,0,5000
"S6","JBL4508","0-5",-25,0,-35,-.3,9.5,6.5,0,5000
"S7","JBL2360","0-5",-25,0,-35,-.1,10.5,6.5,0,5000
"Floor",4
0,0,0
30,0,0
30,0,15
0,0,15
.2076913,1.8,1890,4950
"JOB TITLE - PC MAG"
"Job description filed here"
"Lines 2-8 contain speaker data"
"Lines 9-13 describe floor plan"
"Line 14 contains acoustic data"
```

tractor to write drawing and data files for other speakers. And as more speaker manufacturers get involved with computer-aided design, more speaker spec sheets will include the data needed to enter speaker parameters into programs such as this one.

For the moment, JBL's central-array design program is not for sale to the general computing public. The company plans to place it exclusively in the hands of professional sound contractors, consultants, and dealers.

Anyone who has tried to comprehend flight departure announcements at the airport doesn't have to be told that sound system design often seems to be a precarious blend of science and witchcraft. A little good luck doesn't hurt either. Toss a few extra loudspeakers into the design, and things can get very complex indeed. What the sound contractor really needs is a foolproof way to take all the ingredients, combine them according to a reliable recipe, study the predicted outcome and remix as required.

JBL's *CADP* certainly won't do all the work. In fact, it doesn't even come close. However, it should go a long way towards making the sound contractor's job just a little more predictable and the sound system a little more intelligible. */PC*

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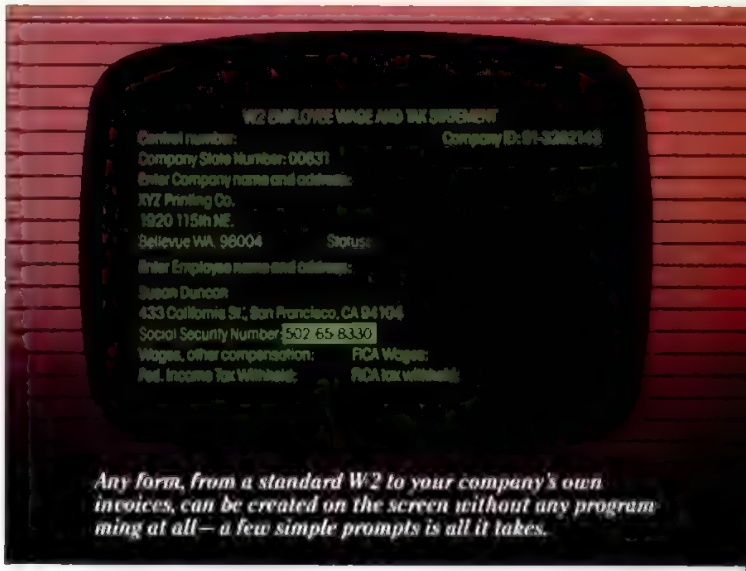
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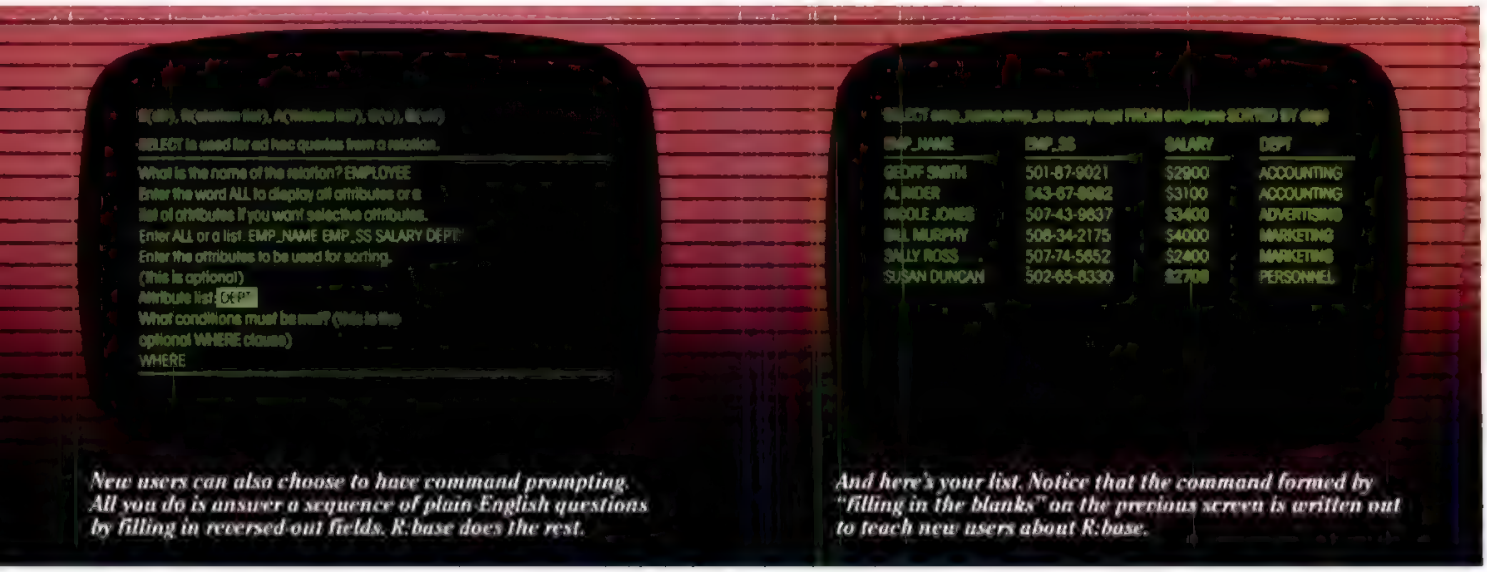
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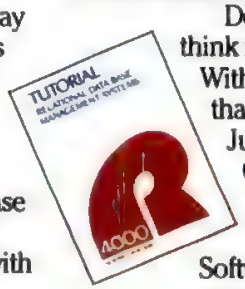
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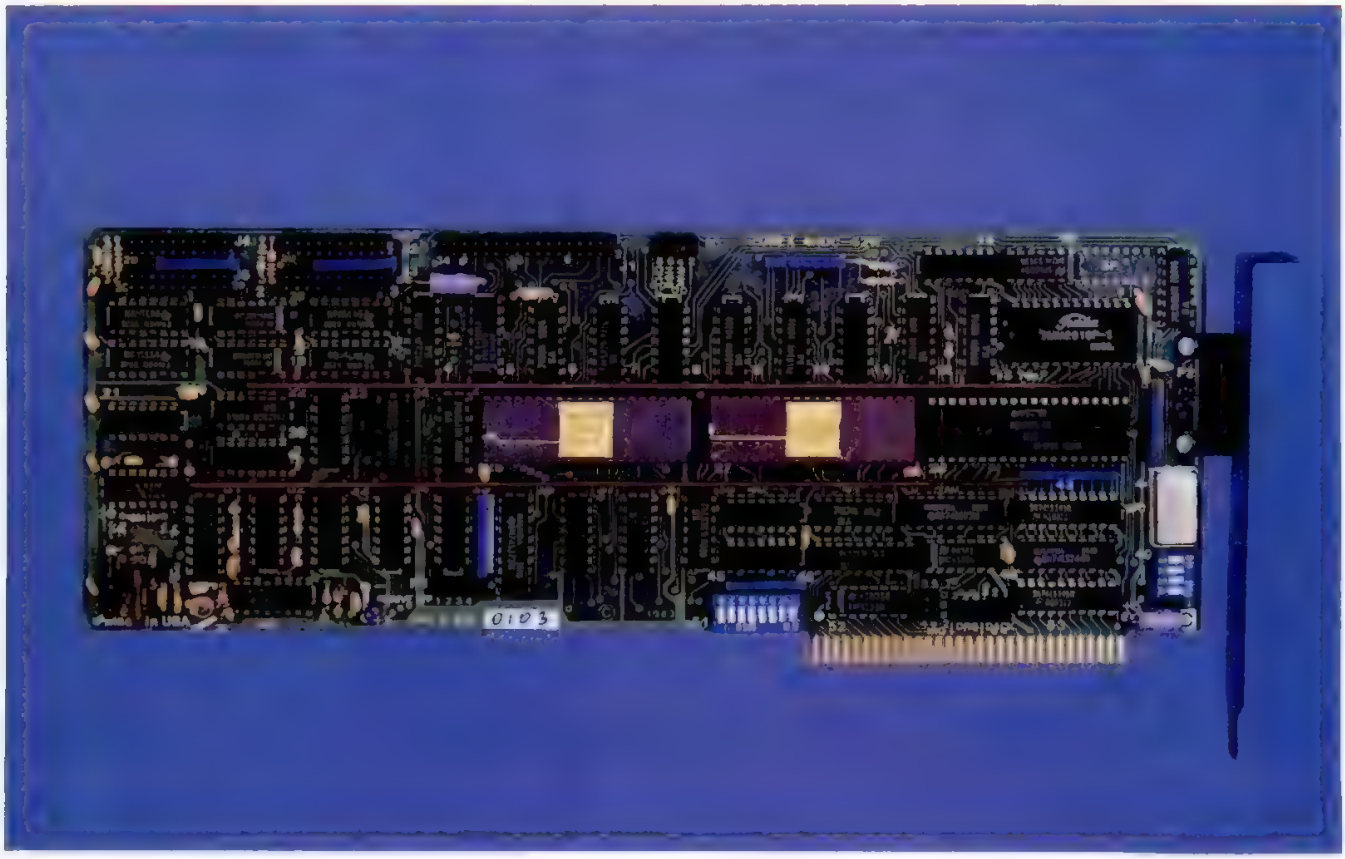
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APPLICATIONS/WINN ROSCH

A personal computer, and particularly the IBM PC, can benefit any size law practice. Here's how practicing attorneys can use—and are using—PCs as legal tools.

A Case For Computers In The Law Office

Given a list of its abilities, you'd think the personal computer had been invented solely to benefit lawyers. It's adept at handling both words and numbers, a whiz at filing, a speed demon at racing through murky, obscure research materials, and rarely late at returning from lunch. Until recently, however, most lawyers have embraced the personal computer as they would a porcupine—tentatively rather than tightly.

A variety of reasons lies behind this reluctance. Like other professionals proud of their centuries-old heritage, many lawyers resist changing their method of practice. Those attorneys who have wanted to advance their offices as far as the state of the electronic art allows have been confronted by the limited availability of applications software that relates to the practice of law. Lawyers who have carefully eyed personal computers have faced a marketplace full of confusion. And despite their years of legal training and experience, few lawyers have had the opportunity to learn about computers and their legal applications.

Perhaps the factor weighing most heavily against computerization, however, has been its cost. Both the price of the equipment and the time needed to learn how to use it have been, until recently, burdensome for large firms and prohibitive for small practices.

FEW lawyers have had the opportunity to learn about computers and their legal applications.

The Promise of the PC

Although the many problems of computerizing are far from completely solved, the IBM Personal Computer, perhaps more than any other machine, has made the promise of personal computing a reality in law offices across the country. The weight of its nameplate, if nothing else, has solved the selection problem. And along with the PC has come a profusion of software: some packages aimed directly at the practicing attorney, and many more programs that are useful to him even though they are designed for more general audiences.

Although the cost of completely computerizing even a small law office remains steep (the price of a minimal but all-inclusive starting system is pegged at about $14,000 by Kline D. Strong, who has written several monographs on computerizing law practices for the American Bar Association), using a personal computer to help in part of a practice can be cost effective and affordable, as well as a good way to learn about the capabilities of small computer systems before making the plunge.

Automating the Law Office

Few law firms would truly like to return to ink wells and quill pens, and few lawyers are completely adverse to innovation. The electronic age actually entered a number of law offices long ago. For instance, many larger firms were quick to take advantage of office automation when the first magnetic card typewriters became available over 20 years ago.

Over one half of the law firms in this country now have some form of office automation, according to Richard Loftin, a

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lawyer, former chairman of the word processing committee of the American Bar Association (ABA), and a consultant specializing in the marketing and distribution of microcomputer software.

However, Loftin believes that large law firms are still the major users of office automation. "Eighty percent of all law firms have four lawyers or fewer, and you've got an awful lot of solo practitioners and two-attorney law offices," he noted. "An awful lot of them just don't have any office automation equipment at all."

Until recently, large practices were the only ones able to afford expensive, single-purpose automation equipment. Most small practices could hardly justify spending $10,000 or more for a dedicated word processor, for instance.

But the situation is changing. Personal computers now have a big advantage over dedicated office automation equipment. Relatively inexpensive hardware can handle a multitude of jobs, which, taken together, might justify the equipment investment. And personal computers equipped with word processing software can handle nearly every function of a dedicated word processor, plus they have one distinct advantage: versatility. One and two man offices benefit because they could not afford separate machines for separate tasks. Big firms need not waste their expenses on duplicative hardware. Not only can one computer handle most jobs, but by networking, its benefits can be shared throughout the office. Complete information about a firm's operations, from payroll to paperwork, can be at any partner's fingertip on the same machine and take up the same desk space that he uses for research and proofreading documents.

ONE AND two man offices benefit because they could not afford separate machines for separate tasks.

Software Support

Although microcomputers have been around for several years, until recently software suppliers didn't really understand lawyers' requirements. But that situation is changing. More and more programs and services aimed specifically at the law office are becoming available, many of them for the IBM PC. The support already exists to allow the PC to handle most everyday law office chores. In addition, attorneys are discovering that general application software packages like electronic spreadsheets and word processors can be quickly and easily adapted to their needs.

Although experts may disagree about the classifications, there are currently about six primary areas in which the use of a personal computer can benefit a law practice: word processing, office management (time, billing, and bookkeeping), research, financial analysis, docket control, and internal document retrieval. Comprehensive software packages aimed at implementing one or more of these functions in the law office are becoming readily available, and many are accessible even to practitioners with little understanding of computers. Systems integrating most or all of these functions have been developed for various minis and micros.

The Word of the Law

"Word processing is the lawyer's stock in trade," noted Loftin. "To me, it is very clearly the biggest need a personal computer can fill for the practicing attorney."

Word processing was the first high technology to sweep into law offices. Years ago, large firms invested in cantankerous, mostly mechanical mag-card typewriters. These were primitive, by microcomputer standards, but extremely useful machines that simply remembered what had been typed, allowed minor corrections to be made, and then created clean copies of documents, without erasures or other marks that might be mistaken for tampering. Standard forms could be created and stored on the magnetic cards and reprinted whenever necessary.

Modern word processing on dedicated word processors or personal computers further extends those capabilities. Not only can simple corrections be made, but major changes and reorganizations of documents can be easily handled. Blocks of text can be stored and names can be merged into standard forms. When a case is active and motions are flying right and left, particular case captions can be stored and automatically inserted with a few keystrokes, as can signature blocks, the standard certification of service, and pages and paragraphs that occur frequently.

THE ability to use a computer is a sign of an attorney's savvy and power.

While it may not be good form for a partner to use a typewriter (many even take pride in their inability to type) this rather provincial attitude is disappearing. The ability to use a computer is a sign of an attorney's savvy and power. Once he is using a computer for other legal applications, an attorney may quickly realize that using it to draft documents can be efficient and not at all menial. Even if his secretary presides over the keyboarding and data entry, a partner who proofreads the secretary's finished versions electronically can be assured of absolute accuracy and no wasted time retyping or reprinting.

The attorney with a small practice may find, in fact, that with a personal computer he can handle most of the office chores for which he might otherwise have to pay an additional secretary.

"There are some solo practitioners who don't have secretaries or who have only part-time secretaries," said Loftin. "The way they can get around having a full-time secretary is with word processing."

In fact, with an answering machine to take care of calls when he's out, a lawyer with a very small practice and a PC might not need a secretary at all.

WordStar, by default or by choice, is the most popular word processing package for the PC, and it is dominant in law offices as well. Other word processing programs are occasionally chosen for their particular strengths. *Peachtext* is credited

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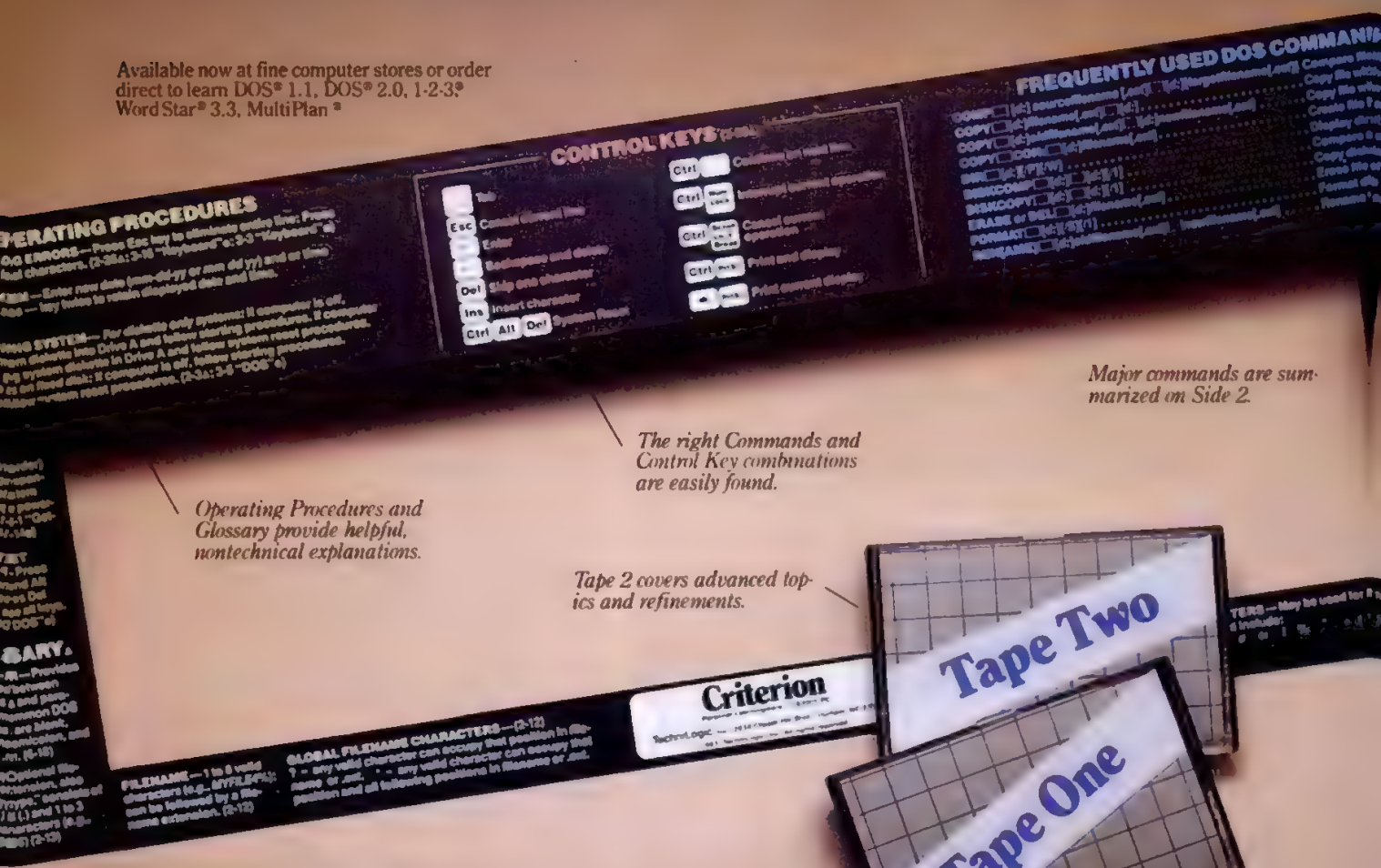
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with excelling at mailing-list and correspondence functions; *WordPerfect* mates well with a legal time and billing package written by the same software company, Satellite Software. Others are selected because they are easy to learn or because their screen orientation helps in preparing better-looking documents and papers.

THE MOST important function of a legal bookkeeping system is tracking billable time, the lawyer's "inventory."

David Carroll Johnson, an attorney who used an IBM System 6 for word processing for 5 years, now uses an IBM PC running *MultiMate*. "After getting it installed, I was able to produce a letter in one afternoon. Now we use it for all typing functions except envelopes and tax forms."

Form Libraries

Related to word processing is a personal computer function Kline D. Strong terms "substantive systems" in his monographs for the Legal Economics Section of the ABA. In a substantive system, standard forms and boilerplate paragraphs for a particular legal specialty are kept on file in electronic data form and when needed are merged together to create free documents. Essentially, the attorney keeps his standard form books on disk.

Although massive electronic form libraries do not exist, some modest versions are becoming available. In the software he has prepared for Radio Shack TRS-80 computers, Strong offers "substantive specialties" in areas like corporations, probate, collections, divorce, and wills and trusts.

Other attorneys prefer to use their standard word processing software to create their own form libraries. "I've taken *WordStar* and set up a prompted, automated will and trust drafting program using *MailMerge*. When I get finished I use the disk file output function to generate the document in electronic first draft form. Then a secretary can go in and customize it and make sure it looks right before it is printed in hardcopy first draft," explained Roger L. Schumaker, a practicing attorney and legal computer consultant.

Tracking Time

In many ways, a law office is a business like any other. The inventory is time; tracking and billing its use are probably the most important office activities when it comes to assuring the firm's income. General purpose accounting software could be used for law office management, except for the fact that attorneys often have different bookkeeping practices than those used by the rest of the business world. Therefore, general purpose accounting software may not fulfill all of a law firm's needs. Most law firms use a different vocabulary from the rest of the business world, and the terminology difference is an easy way to spot a program originally written for another industry, and unconvincingly rewritten for legal use.

The most important function of a legal bookkeeping system is tracking billable time, the lawyer's "inventory." Most law firms use one of three methods for handling their professional time-keeping and billing.

"Manual time-keeping" in larger firms typically involves one or several bookkeepers peering at pale hieroglyphics on ledger sheets for hours, or days, on end. This is a labor-intensive job; the only costs involved are the added payroll expense, which is probably substantial, and the delay and mistakes that follow any human effort.

Many legal firms avoid the payroll costs and some of the errors by farming out bookkeeping work to outside service bureaus. Time sheets are periodically mailed off to somewhere in the blue beyond. Occasionally, after their employees have had time to gawk, gasp, and laugh at the figures, the accounting firm returns the appropriate compilations and bills.

An in-house, computerized accounting and billing system gives a law firm the greatest amount of control over its bookkeeping functions. Until the advent of microcomputers, however, computerized accounting was available only to the prestigious firm that could afford gilt-edged stationery and a multithousand-dollar investment.

The Right Software

By itself, of course, no personal computer, not even the PC, can solve the bookkeeping problem. The job calls for the right software. In the last few years, several software systems have become available to take care of the necessary time and billing functions for most law firms. Most often written in BASIC and usually compiled, these packages require individual billable employees to mark down their working time on appropriate forms. At the end of the working day, all of the time information is loaded into the computer system. Preliminary reports can be generated for approval as often as is desired, so that amounts can be adjusted in accordance with the managing partners' wishes before any actual billing is done. Clients are then billed monthly, or at the conclusion of each case.

The advantages of such time and billing systems are manifold. They are certainly cost effective. At a price in the vicinity of $1,000 for the software, the system pays for itself in a few months. This is especially economical when compared to the cost of outside services. Compared to manual bookkeeping, the system probably will require fewer employees or less employee time to operate and maintain. The automated system saves mailing and waiting time and an in-house system guarantees confidentiality.

AN incidental benefit is the image of efficiency a computer-generated statement presents.

Perhaps the most important management function made possible by the in-house system is the generation of reports. Time can be tracked to make more productive use of personnel and to keep each client's legal expenses under control. This feature is most valuable to large firms; smaller firms will not find the reports as important.

An incidental benefit is the image of efficiency a computer-generated state-

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ment presents. Clients will no longer suspect that their legal expenses are arbitrary or capricious. "For some people, just seeing a bill that has been printed out with a dot-matrix printer makes them think it came from heaven," noted David W. Welty, who uses an IBM PC in his law practice.

No Godsend

A computer is not a godsend that will carve order out of chaos, as many attorneys may expect. "Lawyers should keep in mind that they must have a good manual system before trying to implement it with a computer," advised Richard Loftin. "A computer will not solve the problem of disorganization; in fact, it will make the problem painfully clear. If you add a computer to a screwed-up law office, all you get is a screwed-up law office with a computer."

Setting up a computer system for billing will mean that all time-keeping personnel will have to learn a completely new language of code numbers. Each represents a client and specific case, or a billable activity.

Lawyers should note, in selecting a system, that they probably won't want to deal with the day-to-day running of the programs. That job belongs to the bookkeeping department. The attorney's concern should be the results—the quality of the reports—that the software gives. Let the office manager figure out how it works and whether mere mortals are capable of successfully running it. The lawyers will have enough problems figuring out what to do with all those new code numbers.

A computer is not a godsend that will carve order out of chaos, as many attorneys may expect.

The current trend is clearly to integrate time and billing systems with general office accounting in legal software packages. In a truly integrated system, data is entered only once, and the software is able to share the information between different parts of the system. The accounts receivable program should be able to use time-keeping information without any intricate file or data shifting commands and certainly without any additional data entry.

A listing of several of the available office management/time and billing programs aimed specifically at the law office and a comparison of some of their features accompanies this article. Most of the listed software manufacturers make available demo diskettes (prices from $20 to $100) that give an overview of how their system works, without giving enough of the program to do anything useful. Buying the wrong demo is a cheaper mistake than buying the wrong software system.

The Research Giants

The existing modern electronic legal databases have condensed the bulk of the largest law library into one small machine. Not only does this save shelf space, but it can tremendously increase the speed of legal research. With the proper equipment, legal research no longer means that an attorney must painstakingly explain issues to clerks or paralegals, or take a trek down to the law library himself.

Most lawyers are by now familiar with the names Lexis and Westlaw, the two largest legal databases. The chief difference between them used to be their availability. Until November, 1983, Lexis required that its own terminals be used, which meant paying a monthly fee for renting at least one additional electronic box to sit around and clutter the office. Westlaw, on the other hand, primarily encouraged access through existing data terminals, word processors, and personal computers.

The situation has changed substantially. Now Westlaw will gladly rent you a terminal, and Lexis can be accessed using the IBM PC.

"We realized the marketplace wanted a choice," explained Ann Baines, division communications manager for Mead Data Central (Lexis' operator). "When we started 10 years ago, terminals were too difficult for most people to use. Now powerful machines like the IBM PC are easy to use, and people are more willing to use them."

The necessary software for accessing Lexis through your PC is available through IBM for about $200. On request, West Publishing (Westlaw's operator) will send the names and addresses of firms offering compatible communications software for various small computers (including the IBM PC).

Both Lexis and Westlaw allow the attorney to read the entire text of nearly every decision in recent times.

Both Lexis and Westlaw allow the attorney to read the entire text of nearly every decision in recent times. Current libraries go back decades, with even greater depth planned for the future. Case materials can be located by citation, case name, date, judge, or statutory reference or the entirety of each database can be searched using key words or combinations of words (say "proximate cause," or the occurrence of "arson" and "marshmallow" within five words of one another). Both database services offer electronic versions of *Shepard's Citations*, a legal reference. Westlaw also includes its famous headnote system and full compatibility with its printed materials. Lexis allows access to Mead's LexPat patent database.

Evaluating the two major legal databases strictly on their cost differences may require assistance from your PC. The basic time rate is less expensive with Lexis ($90 for the first 5 hours, falling to $30 per additional hour over 100 in a month, compared to Westlaw's rate of $115 for the first 3 hours, decreasing to $65 per additional hour over 100 in a month). Lexis, however, adds an additional charge for searching. To compound matters, Lexis lowers its basic rate to $45 per hour in off-hours. Lexis also charges for each user ($100 for the first one, plus $10 each for the next 20, $4 each for the next 60). If you don't have a PC, a monthly rental fee of $55 is charged for each terminal. Westlaw, on the other hand, charges only per terminal—$100 for the first one connected, $50 each for the

Sources Of Interest To Law Professionals

A sampling of products and services for attorneys who work with PCs.

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(716) 546-5530

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Lexis
Mead Data Central
9333 Springsboro Pike
P.O. Box 933
Dayton, Ohio 45401
(513) 859-1611

CIRCLE 788 ON READER SERVICE CARD

Westlaw
West Publishing Co.
50 West Kellogg Blvd.
P.O. Box 3526
St. Paul, MN 55165
(612) 228-2500

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Research Alternatives

Auto-Cite, from Lawyers Co-operative/Bancroft Whitney Publishing Companies, can aid in legal research by providing citation validation, parallel and topical reporter citations, and American Law Reports (ALR) and Lawyer's Edition (L.Ed.) annotation references from the entry of a single citation. It can be as much as 10 times faster than manual citation checking, usually offers more details on case histories, and is often more current than manual systems.

Although these case-law databases are useful primarily to attorneys involved in litigation, other more general ones that can be accessed with personal computers offer aid in other legal specialties. "We use CompuServe to get stock prices to evaluate estates," noted Roger Schumaker, who uses his IBM PC primarily for estate and tax planning.

Besides the general-consumer oriented Source and CompuServe, other databases, such as Mead's Nexis, Dow Jones, and Lockheed's Dialog allow access to more specialized information and news for factual research and planning.

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Note: Software marked "Requires CP/M" does not run directly on an IBM PC, but can be made PC-compatible with the addition of a "Baby Blue" or other CP/M conversion card. Many of these packages are being rewritten in PC-Dos.

and expertise is the law, in many legal specialties the practices of law and business are intertwined. Business analysis is especially important in legal counseling when tax alternatives are being considered. In this area, legal advice often depends upon knowing the effects of business alternatives.

IN THIS area, legal advice often depends upon knowing the effects of business alternatives.

To help in the decision-making process, attorneys specializing in business law and estate planning—fields that are very dependent on tax analysis—are turning to the IBM PC. Attorneys may take advantage of canned application software packages, or develop their own using available spreadsheet programs (1-2-3 appears most popular among PC-packing lawyers) or a high-level language like BASIC.

David W. Welty has used an IBM PC for the last 10 months of his 9 years of practice in closely held corporations and estate planning. "It's a very valuable tool that allows me to more quickly compare the performance of a company over a period of time.

"I've also written a program with 1-2-3 where I plug in certain numbers from a business' financial statements, and it analyzes them in light of Internal Revenue System rules and regulations that relate to evaluating a business. I use the results to adjust the business' income statement, by capitalizing over a certain period, for instance. I'll be interested in seeing the reaction of the IRS auditing agent," he added.

Beyond Word Processing

David Carroll Johnson plans greater computing applications in business and estate planning beyond his present, word processing-only use of his firm's IBM PC-XT. "I'd like to use the machine to make projections in the lease and loan area, and

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SEVERAL extremely good tax and estate planning software packages are available for the IBM PC.

I'd also like to use it in the computation of variables to answer questions like, 'What would my taxes be if I died in any of the years 1983-87 as the new Economic Recovery Tax Act steps in? What if I change the marital deduction formula from a maximum unlimited marital deduction to a limited specific amount marital deduction? What will the difference in tax be?' I'd like to do some modeling with it and perhaps use it in business evaluation."

Several extremely good tax and estate planning software packages are available for the IBM PC, although finding the right one for a particular practice can be difficult. Roger Schumaker wrote his own software because he couldn't find anything that suited his style of practice. "Aardvark Software has a very good estate planning program," he said, "but it's so very sophisticated. I can sit down and run my own program in 5 minutes; I'm sure it would take me half an hour or 45 minutes to run Aardvark's because it is so much more detailed. I wanted something fairly simple that fit in with the way I was already practicing.

"A lot of attorneys give two hoots about estate analysis in estate planning," he continued. "They sort of eyeball it and say, 'Let's do this for them.' Sometimes they don't realize what the results might be. I wanted something that was very simple to present to my clients, so we developed a two-page illustration that showed the tax results on the estates of a husband's death followed by his wife's death, and a wife's death followed by her husband's death. The computer helps show how different marital deduction options can affect the ultimate amount of property that can be passed to a family member."

In most cases, writing your own programs may not be the right solution. Schumaker, however, had an excuse. "I got hooked on programming for a while," he admitted.

Internal Document Management

The same legal issues often arise time and again in firms specializing in one area of practice. It is valuable for one member of a firm to be able to seek out and find previous, related work that had been done in-house.

As Richard Loftin explained, "The problem is especially critical if you've got more than one lawyer in a firm. For instance, you're prosecuting a case involving a wreck of an ambulance. And you think, 'Say, I think one of my partners did a brief on this subject. I wonder where it could be?' But you have no idea where to find it. You end up doing the legal research all over again. You need a way to retrieve that document, a specialized sort of database management system within the firm. What you do is extract key words from documents and store them away so that you can then retrieve a synopsis of the document and a number which tells you where it's physically filed.

IT IS valuable for one member of a firm to be able to seek out and find previous, related work that had been done in-house.

"It's an area just coming into use, but it's fairly easily implemented and can save a great deal of time. I have seen a package demonstrated, but I don't know if it's on the market."

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ager programs like *dBase II*. But keeping the entire written output of all but the smallest firms on-line is a memory task beyond the capabilities of all personal computers and all but the most elaborate minicomputer systems. Digests and listings of key words should be filed electronically in the database system as an index to the firm's traditional filing system.

DOCKET control is so important that some insurance companies will give discounts for a properly implemented system.

Meeting Deadlines

"I think it's generally accepted that the most common cause of malpractice claims is failing to meet a deadline," said Loftin. "Docket control is so important that some insurance companies will give discounts for a properly implemented system. It need not necessarily be a computerized system, but putting docket control on a computer is a little bit better than a manual system."

The essence of docket control is keeping track of important dates. More than an appointment calendar, it's also a tickler to remind of filing deadlines and the running of statutes of limitations.

Basic docket control systems may be incorporated into a law office management package, providing the ability to generate daily reminder or appointment sheets outlining engagements for the day. Newer legal time and billing systems incorporate built-in calendars.

Reports and reminders can be generated as chronological listings so that one member of a large firm can insure that all appointments, filing dates, and statutes of limitations are met. Individualized sheets also can be prepared for each partner and associate.

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er can help an attorney keep track of his appointments and time, but so can a desk calendar. It requires about as much effort to write or enter the appropriate times and hours in each.

A *computer won't organize a law office, but it might force a firm to better organize itself.*

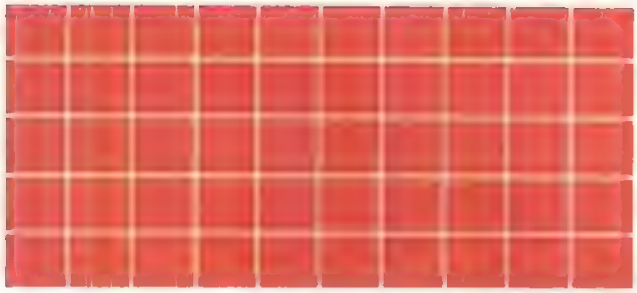
A computer won't organize a law office, but it might force a firm to better organize itself. Although a time and billing system will bring order and speed to bookkeeping, the time-savings value may not be worthwhile unless the client list is lengthy.

Certainly the reports the computer system generates can be valuable in determining who is spending how much time on what. This information can help put office time to more effective use. But if you're flying solo or sharing a secretary with your former law school roommate, you probably won't need the reports or the system. You know what you did and why—or you should.

As the office manager for a small firm, a computer can record and keep track of time, but it cannot make it. Nor will a computer create new clients.

On the other hand, word processing can save time in any size practice. It can help small firms give their work a more professional look, and it can help the solo practitioner handle his entire office by himself. Financial planning and tax packages can make any attorney's time more productive and valuable. As the law changes, so does its practice. The personal computer can help increase office and personal efficiency by automating tasks that were previously time-consuming and otherwise impractical. Primarily, though, it is a tool that an attorney can use to provide entirely new services to his clients. */PC*

Winn Rosch, a contributing editor to PC, is a recent law school graduate and a candidate for admission to the Ohio bar.



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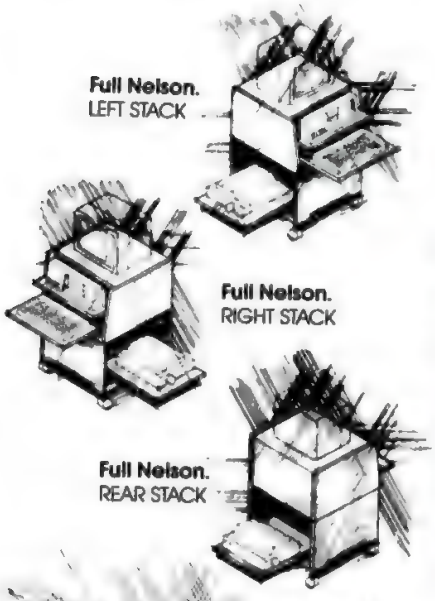
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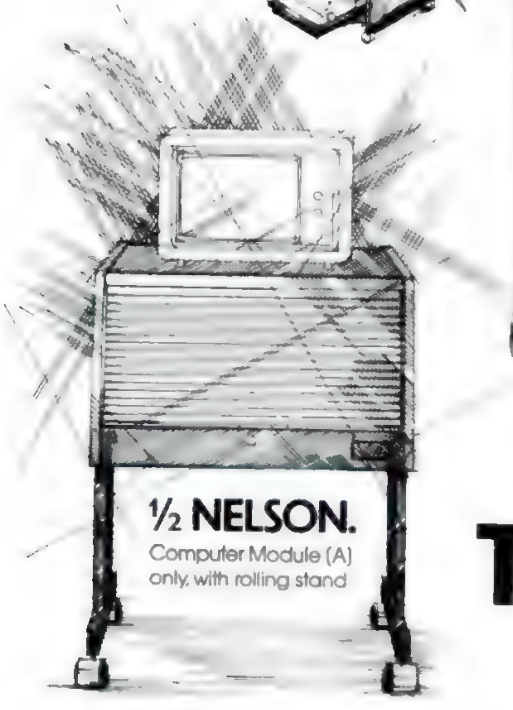
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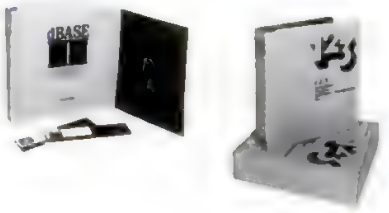
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Automated offices are calling for increasingly complex design of work space. An architectural consultant describes how he uses PCs to plan office space.

An Architect Designs With The PC

The computerized office has been evolving for nearly 15 years. Architects, as the creators of these environments that house office workers and their computers, have themselves begun to use microcomputers in the planning and design process. The IBM PC, with its low cost and high accessibility, has a bright future in this area.

Traditionally, architects have been most interested in using the computer for graphics applications and have attempted to use the machine as a design tool. The greatest use of graphics in architecture has been to create the final production drawings, from which a finished design is actually built. But the graphics applications of the computer are not well-suited to this design process. Relatively few graphics systems allow three-dimensional modeling of buildings and interior spaces, the kinds of flexible tools needed to support design development.

Other applications do exist, however, for architectural firms interested in automating the office with a computer.

Architects concerned with functional planning, for instance, need data management programs. Since the early 70s, I have specialized in office facility planning and layout and have been involved in the development of the automated office as both a consultant and as an end user. Among other projects, I have developed information system programs that can be used by the architect to structure the information upon which functional designs are based.

When I began, over 15 years ago, to look for ways to use the computer in office facility planning, a time-sharing system offered an attractive solution to several problems. I knew I needed access to a computer, but was not in a position to make the substantial financial commitment to a standalone device that was required at the time. I used "dumb" terminals, which were connected to the time-sharing system, at the cost of $15 per hour. Time-sharing put the whole endeavor on a pay-as-you-go basis, which has proved cost effective over the year.

I learned BASIC, which then was virtually the only language available in the time-sharing environment, and began to develop my own programs to handle facilities requirements information. What I was looking for initially was a means of relieving the tedium of tabulating all of the detailed work station and equipment information in relation to manpower projections. I also needed a means of updating these reports periodically.

My initial primitive efforts evolved into a system of interrelated programs that would not only add up the numbers, but could produce various kinds of summaries and forecast growth trends, which were useful to management as well as the designer. The program can prioritize the placement of individual work stations to best support communications and workflow. Eventually I added modeling rou-

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tines that could do such things as calculate area assignments based upon a menu of specified furnishings. The modeling capability added a great deal of flexibility to the system, allowing for cost comparison evaluation of different planning approaches.

For nearly a decade, I used "dumb" terminals connected to the time sharing system, and the costs rose almost annually. Although the system was proficient at data manipulation and report preparation and speedy at number-crunching, the network offered no effective graphics capability.

For these reasons, and the low cost of micros, I bought an IBM PC in 1982 and began to convert my program package, which had reached its fourth incarnation on the time-sharing system. I was used to the unlimited resources of the time-sharing mainframe and at first was unsure that any microcomputer could do the job. On the other hand, just knowing that I was totally free to experiment without worrying about $15-per-hour connect charges plus CPU time was psychologically liberating. I soon found that the PC could indeed do a lot!

THE PC'S ability to sort the same information repeatedly into different categories makes it invaluable.

Space Planning

One of the first steps in facilities planning is the development of a space program. Not to be confused with astro-exploration, the space program is a database that defines the client's, or end user's, requirements. The space, or facility, requirements program must first be formatted in such a way that it reflects the client's management structure.

At the same time, the format of the space planning database must also serve the needs of the architect and planners. Spaces that are similar need to be grouped and tabulated, and physical clustering patterns that will support departmental relationships, communications, and workflow should be identified. The same data is examined from a number of different angles. The PC's ability to sort the same information repeatedly into different categories makes it invaluable for this application.

The space planning database also must be designed to accommodate change. Inevitably, the client's requirements will change many times during a project's development, and the facility program must be responsive to such change. The PC can selectively edit and update the database.

I discovered that the marriage of the PC to the mainframe could give me the best of both worlds. The time-sharing service provided a number of very handy utilities, such as file editors and fast sorting and search-and-replace routines. A good screen editor such as the *IBM Professional Editor* provided a great deal of flexibility in handling ASCII files, including sequential data and text files and source programs. I even used it to scroll through large report files before printing them out in hard copy.

Sorting caused me great concern at first, as I was told by personnel at any number of computer stores that sorting utilities did not exist. But, with the help of Donald Knuth's book, *Sorting and Searching*, and Nicklaus Wirth's superb text, *Algorithms + Data Structures=Programs*, I developed some very fast sort routines that served my needs quite nicely. In fact, playing around with sorting algorithms on the PC can be at least as rewarding as playing video games.

Search-and-replace operations on random data files were not particularly a problem either, especially with compiled BASIC which supplies the necessary speed. This type of edit allows you to scan through a data file, first to find the location of a specific combination of characters, and, then, if desired, to replace them with different characters.

The report-writer programs came next. They allow you to prepare complete facility requirements documentation for fairly sizable projects on the PC alone. (By sizable I mean an office of up to about 150,000 square feet, or space for some 500 people.) Here is where the ability to connect the PC into the time-sharing network comes in very handy, because on very large projects the data can be captured and initially edited off-line and, then, after being passed through a format conversion program, uploaded to the mainframe. Once there, the data file can be processed through similar report-writer programs and printed out at any location on high-speed line printers.

PLAYING around with sorting algorithms on the PC can be at least as rewarding as playing video games.

User-Friendly

Many of the applications I developed are now used by Griswold Heckel and Kelly Associates, Inc., a national interior design company. In its five offices the firm now uses six PCs linked together through a time-sharing network. For standalone applications, *WordStar* is used to produce general correspondence and to prepare proposals and specifications. From time to time the firm publishes a newsletter, as well as promotional mailings, which are also prepared on the PCs.

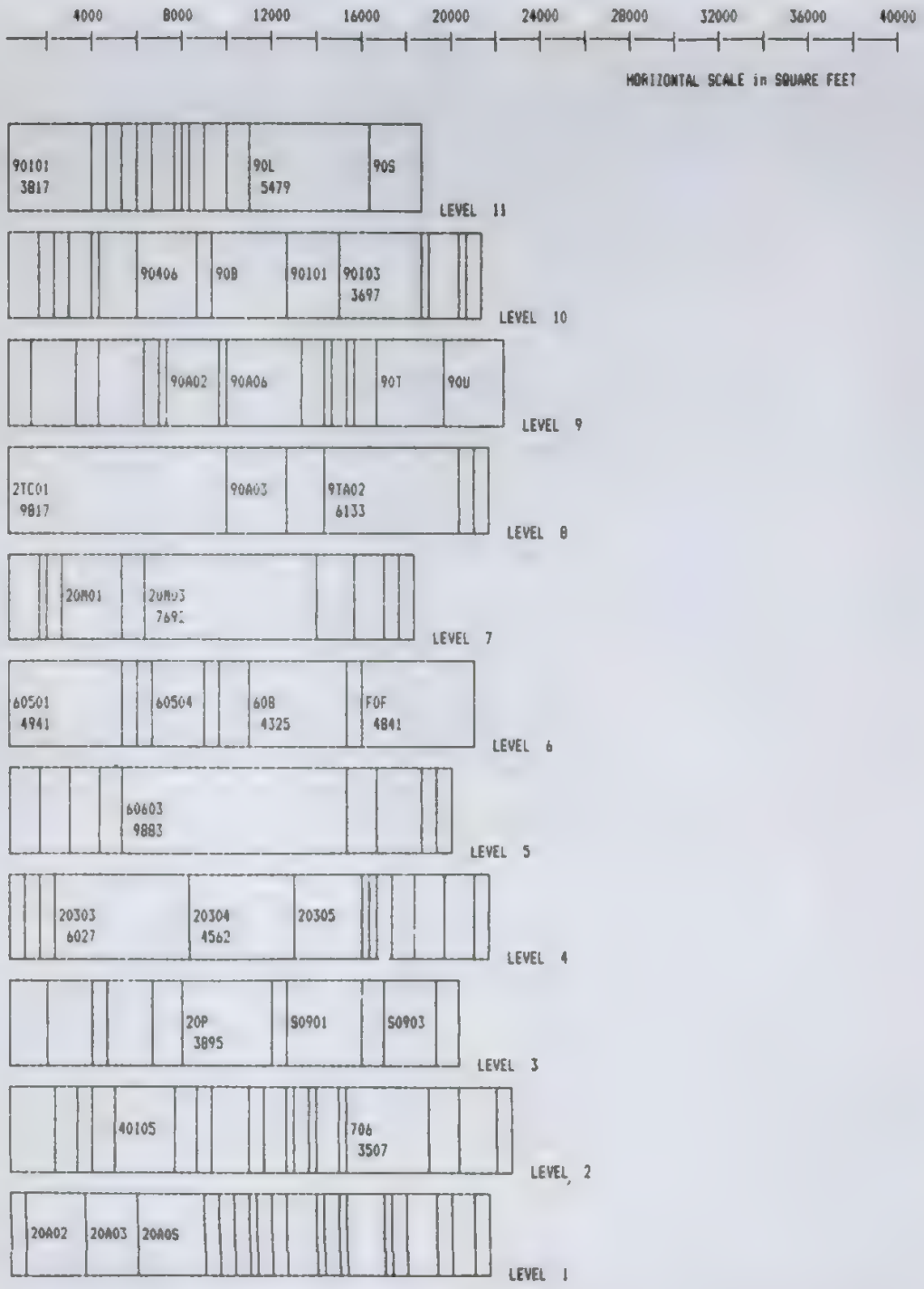
VisiCalc is used to prepare project budgets and construction estimates, along with *VisiSchedule* for project scheduling. In addition, however, a number of specialized programs that I developed are used for several applications that are unique to the architect's profession.

One of the most important aspects of using computers in a design environment is making them accessible to people without extensive computer background. In converting the space requirements analysis programs for the PC, I started with a user-friendly data-entry and editing program to make the system accessible to Griswold Heckel and Kelly's designers with no prior computer experience. This was followed by a sorting program that would rearrange the data file (once it was entered) into any one of a number of useful sequences for further editing and analysis.

In addition to project-related applications for planning and design, the compa-

STACKING DIAGRAM

New Corporate Headquarters Scheme A.



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New Corporate Headquarters Scheme A.

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Figure 1: An architect can use stacking diagrams like those shown on these two pages to help determine the optimal floor size of a building based upon the client's functional requirements. The facility manager or space planner can also use this program to evaluate different candidate buildings in order to establish which ones best fit the end user's needs. Individual blocks of space are determined by the space program, and they can be easily rearranged in different configurations on a basis of adjacency relationships and workflow. These two examples show how the same set of program requirements fit into two very different building shapes. Scheme A (opposite) uses eleven floors of slightly more than 20,000 square feet, while Scheme B (below) requires seven floors of approximately 32,000 square feet each. The total programmed space requirement was 225,000 square feet.



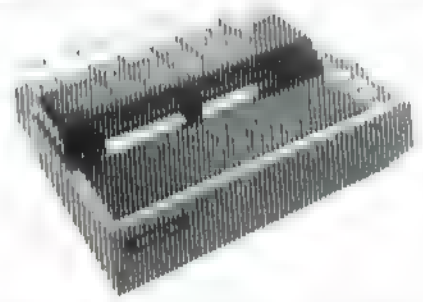
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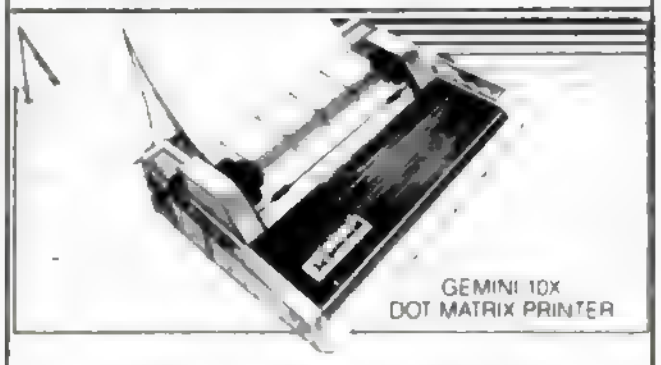
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ny uses the PCs for a number of management functions. A typical architectural project is usually broken down into five administrative budgetary phases. This standardization is reflected in the various contract forms published by the American Institute of Architects, a national professional organization. Virtually every architectural and design office does its billing from weekly or bimonthly time cards, and it is useful to be able to track the accumulation of time expended according to phase, in order to control the budgeting of each project in the office. Using PCs in combination with the time-sharing service's computer, I was able to put together a system that would effectively support the firm's project management and billing needs.

At the end-of-year payroll period, each staff member's time card is entered into the microcomputer using a menu-driven edit program. After being sorted, the data file is uploaded to the mainframe using a standard communications package. A project status report is then produced showing the current situation in regard to each job in the office, as well as "indirect" time, such as sick leave and vacations.

Connecting the PCs to the time-sharing network in this case made it possible to easily move data from one of Griswold Heckel and Kelly's five locations to another. Since the service bureau the company uses maintains offices in most major cities, it can have a report printed out at any location, while making each office responsible for capturing its own time card information.

At the end of each month, the time card files are consolidated and a monthly billing summary is produced for invoicing purposes. The main accounting department happens to be located in New York, but billing from each individual location would be just as easy with this type of a system. Control over the main database, containing project history and necessary payroll information, can be maintained from any central location using the PC as a terminal.

Another interesting advantage to computerizing this type of function is the ease with which project cost history data can be accumulated. By saving time card records on disk and merging them together at the end of a project, summaries can be produced, which are invaluable when developing budgets for future jobs.

ONE OF the most important aspects of using computers is making them accessible to people without extensive computer background.

Graphics Capabilities

Recently, I have begun to take advantage of the considerable graphics capabilities of the PC using a BASIC program I wrote to create stacking diagrams illustrating space relationships. Stacking diagrams are essentially bar charts showing how an organization's various departments can fit into the floors of a building. These can be used to analyze how well a given arrangement satisfies important adjacency relationships or what floor size works most efficiently for a particular type of organization. They can be used in several other ways by facility managers, for example, to calculate rental charges to individual departments and to keep track of available space in multitenant buildings.

The stacking diagrams in Figure 1 were produced on the PC using the IBM graphics printer and show the same client's program requirements interpreted for two distinctly different buildings. I used this technique to make a large number of such studies to evaluate the fit of various buildings for a large corporation planning to move its headquarters.

Having worked with the PC to design office space for just a year, after using large computers for more than 10 years, I am convinced that the IBM Personal Computer truly enhances the creative process. Maybe *personal* is the operative word here. After all, designing is an intensely personal thing, and I cannot now imagine doing it without a PC. */PC*

Jeffrey E. Clark has specialized in corporate office planning for 16 years. He is currently a vice president of the national interior architecture and design firm, Griswold Heckel and Kelly Associates, in Chicago, Illinois.

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CIRCLE 347 ON READER SERVICE CARD

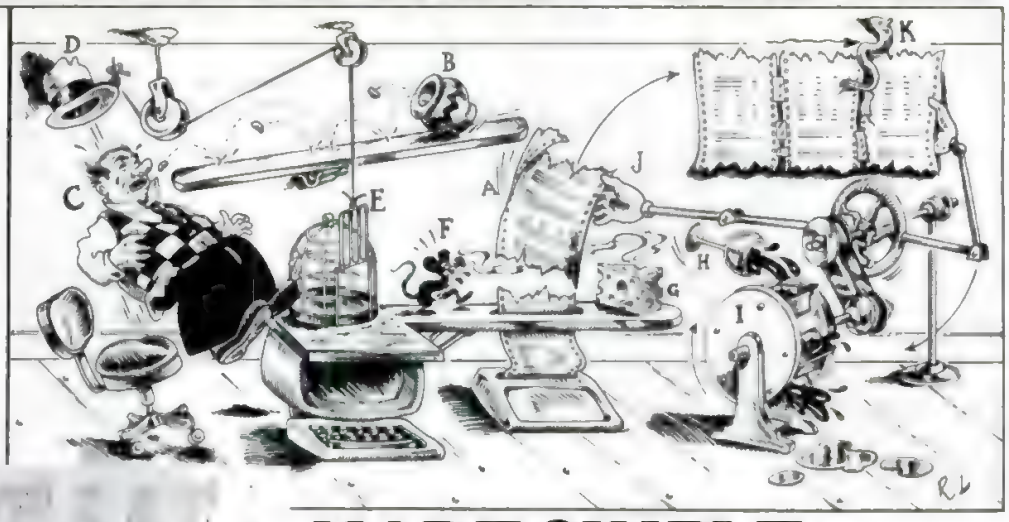
SIMPLIFIED SPREADSHEET ASSEMBLY

RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBOBULATED THAT HIS HAIR STANDS ON END, DISLODGING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

SHEET IS TAPED SECURELY IN PLACE BY TRAINED ADHESIVE TAPE WORM (K).



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CIRCLE 661 ON READER SERVICE CARD

Far too many real estate-related programs have been written without much regard, if any, for the needs of professional realtors. Such programs have usually included whatever features were convenient for a programmer to write, which didn't add up to packages that handled useful sets of tasks in this profession.

Property Management by Continental Software is a delightful exception to this unfortunate trend in the history of real estate software. The program is well thought out and is written from the perspective of property managers. It is designed to make life a little less complicated in this specific area of real estate, which has more than enough headaches and frustrations built in.

A property manager has to keep track of rent, deposits, credits, late rent, balances due, additional monthly charges, number of keys issued, car license numbers, lease dates, rent increases, vacancies, names, addresses, phone numbers, and dozens of other things like the costs of repairs, maintenance, utilities, and advertising.

The *Property Management* program takes care of all of these tasks and can produce reports that make all of the information readily available any time the property manager needs it. At the end of the month, the *Property Management* program can not only print out just about any kind of report needed and tenant mailing labels, but also transfer all relevant financial information to the data disk of an accounting program, such as Continental's *Small Business Accountant Software* or IBM's *Personal Computer Accounting System* (written by Peachtree).

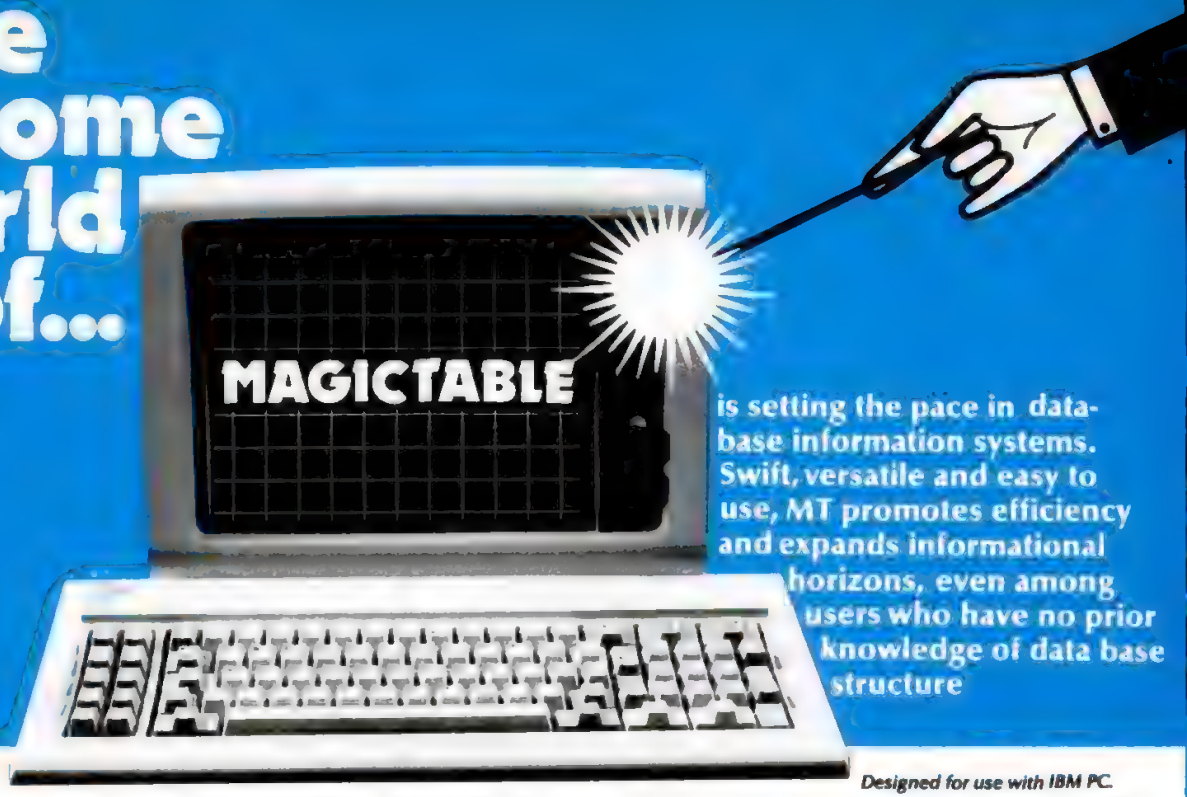
Property Management is a program designed to handle office complexes, apartment buildings, single family residential rentals, and mobile home park space rentals. It also handles additional monthly charges for pets, RV parking, and storage.

Continental Software has already established itself with programs like *Home Accountant Plus* (see "Five Financial Programs For The Home," PC, Volume 1 Number 10), which is currently a top selling program. Its *Property Management* program has been available on the Apple II for some time.

The Scale of the System

The *Property Management* program comes on two disks. Disk 1 contains the programs for initially setting up the system and entering and posting transactions. Disk 2 includes the print functions, generate a wide variety of reports. If you have a double-sided disk drive, both program disks can be combined on one 320K disk. Those with single-sided systems are at a disadvantage, because disk switching will be necessary when going from transactions and posting to printing and then back again. The program was obviously written and designed

The Welcome World of...

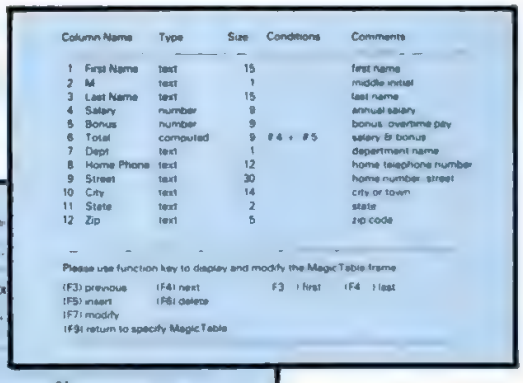


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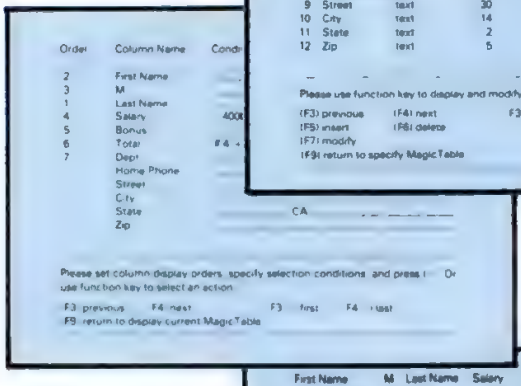
...a powerful, information management tool which urges the user to create, manipulate, explore...



Column Name	Type	Size	Conditions	Comments
1 First Name	text	15		first name
2 M	text	1		middle initial
3 Last Name	text	15		last name
4 Salary	number	8		annual salary
5 Bonus	number	9		bonus, overtime pay
6 Total	computed	9	#4 + #5	salary & bonus
7 Dept	text	1		department name
8 Home Phone	text	12		home telephone number
9 Street	text	30		home number, street
10 City	text	14		city or town
11 State	text	2		state
12 Zip	text	5		zip code

Please use function key to display and modify the MagicTable frame

(F3) previous (F4) next F3 : first (F4 : last
(F5) insert (F6) delete
(F7) modify
(F9) return to specify MagicTable

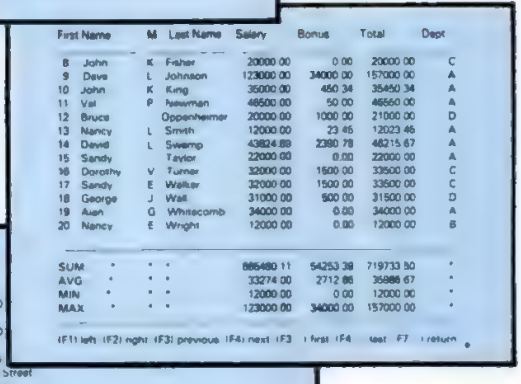


Order | Column Name | Condi

2 First Name
3 M
1 Last Name
4 Salary 400
5 Bonus
6 Total #4 +
7 Dept
Home Phone
Street
City
State CA
Zip

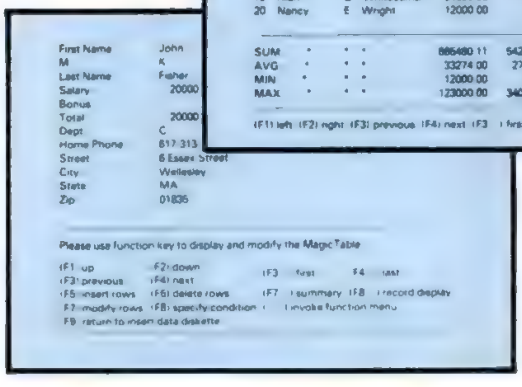
Please set column display orders, specify selection conditions and press (Or use function key to select an action

F3: previous F4: next F3 : first F4 : last
F9: return to display current MagicTable



	First Name	M	Last Name	Salary	Bonus	Total	Dept
8	John	K	Fisher	20000.00	0.00	20000.00	C
9	Dave	L	Johnson	123000.00	34000.00	157000.00	A
10	John	K	King	35000.00	450.34	35450.34	A
11	Val	P	Newman	46500.00	50.00	46550.00	A
12	Bruce		Oppenheimer	20000.00	1000.00	21000.00	D
13	Nancy	L	Smith	12000.00	23.46	12023.46	A
14	David	L	Swamp	43824.89	2390.78	46215.67	A
15	Sandy		Taylor	22000.00	0.00	22000.00	A
16	Dorothy	V	Turner	32000.00	1500.00	33500.00	C
17	Sandy	E	Walker	32000.00	1500.00	33500.00	C
18	George	J	Wall	31000.00	500.00	31500.00	D
19	Alan	G	Whitecomb	34000.00	0.00	34000.00	A
20	Nancy	E	Wright	12000.00	0.00	12000.00	B
SUM	*	*	*	886480.11	54253.38	719733.50	*
AVG	*	*	*	33274.00	2712.86	35886.67	*
MIN	*	*	*	12000.00	0.00	12000.00	*
MAX	*	*	*	123000.00	34000.00	157000.00	*

(F1) left (F2) right (F3) previous (F4) next (F3 : first (F4 : last (F7 : return



First Name John
M K
Last Name Fisher
Salary 20000
Bonus
Total 20000
Dept C
Home Phone 617-313
Street 6 Essex Street
City Wellesley
State MA
Zip 01835

Please use function key to display and modify the MagicTable

(F1 : up (F2 : down
(F3 : previous (F4 : next (F3 : first F4 : last
(F5 : insert rows (F6 : delete rows (F7 : summary (F8 : record display
F2 : modify rows (F8 : specify condition (: invoke function menu
F9 : return to insert data diskette

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There are limitations to *Property Management*. Continental Software hangs its hat on the fact that the program can handle up to 1,000 units of property. This is true, but only if you use a hard disk system. A 320K disk is said to hold "up to 500 units" and a 160K disk holds half that. The real limitation, however, is that only 25 properties may be defined. Given the maximum 500 units, with 25 properties you could, in theory, track up to 20 units per property.

If you have more than 25 properties to manage, you will need to set up different data systems on separate disks, or separate systems stored on a hard disk. There is a real difficulty with the manual's explanation of the system's capacity. Backtracking through the paragraphs of explanation is nearly as confusing as following instructions for assembling a dollhouse.

At the end of that section, the manual finally states a more realistic view of the program's capacity: "One property with 500 units or two properties with 75 units for 320K disks. (Half that amount for 160K disks)."

The manual also makes note of one other point to consider on limitations: As the number of properties (and the amount of tenant information) increases, the system works more slowly when sorting and performing other functions.

THE MANUAL'S explanation of the system's capacity is nearly as confusing as following instructions for assembling a dollhouse.

Figure 1: Main Menu for Property Management *program. A module is called up by typing in its three-letter code name.*

```
&PROPERTY BLDG 1                    #DATE 03/01/81
          P/M FUNCTION SELECTION MENU
      HOME  MASTER SELECTION
      PIM   PROPERTY INFO MAINTENANCE
      RIM   RENTAL UNIT INFO MAINTENANCE
      TIM - TENANT INFO MAINTENANCE
      IEM - INC/EXP ACCT MAINTENANCE

      PFR   POST FIXED RENTS/LATE CHGS
      PTA   POST TENANT ASSESSMENTS
      EDT - ENTER DETAILED TRANSACTIONS
      PDT - POST DETAILED TRANSACTIONS
      EDE - ENTER DETAILED EXPENSES

      QRS - QUERY RENTAL STATUS
      RPG - REPORT GENERATION
      PME - PROCESS MONTH END

      RST - RESORT DATA BASE
      SYS - CHANGE SYSTEM (OR DATA DISK)

            ENTER DESIRED SELECTION?
```


```
&PROPERTY BLDG 1                    #DATE 03/01/81
          P/M FUNCTION SELECTION MENU
      HOME- MASTER SELECTION
      PIM   PROPERTY INFO MAINTENANCE
      RIM   RENTAL UNIT INFO MAINTENANCE
      TIM - TENANT INFO MAINTENANCE
      IEM - INC/EXP ACCT MAINTENANCE

      PFR - POST FIXED RENTS/LATE CHGS
      PTA - POST TENANT ASSESSMENTS
      EDT - ENTER DETAILED TRANSACTIONS
      PDT - POST DETAILED TRANSACTIONS
      EDE - ENTER DETAILED EXPENSES

      QRS - QUERY RENTAL STATUS
      RPG - REPORT GENERATION
      PME - PROCESS MONTH END

      RST - RESORT DATA BASE
      SYS   CHANGE SYSTEM (OR DATA DISK

            ENTER DESIRED SELECTION?
```


Each *Property Management* function is performed in "modules," which are listed in the main menu (see Figure 1). Each aspect of what is done in different program functions is handled by a module, complete with a menu of selections to choose from. Entering transactions is handled by one module, posting is done by another, and so on. The menus that take you from module to module are presented well and are helpful and easy to follow.

One of the major weaknesses of *Property Management* is the long delay in going from one module to another. You must wait from 35 to 50 seconds when changing modules. During the delays, the computer lets you know that it's doing something by flashing the words "LOADING" or "WORKING" across the screen.

The program also suffers from a few minor weaknesses, which require some adjustments by the user. However, almost every weakness is balanced by a convenience that compensates for it.

As an example of a weakness, when you enter the date, you must press the Return key after the month, after the day, and after the year as well. Most users will enter the date using slashes or dashes to separate the figures, not thinking to press the Return key so many times.

On the other hand, *Property Management* anticipates your responses and manages to guess correctly an impressive percentage of the time. The program automatically calculates rent amounts and other costs, based on how you originally set up the properties. If you want a figure other than the one presented, you just type over it. In the case of lease dates, once you enter the starting date, the program assumes it's a 1 year lease and fills in the date 1 year later as the ending date.

Starting the System

With the program disk in the A drive and your data disk in the B drive, you are ready to start. Whether you have a single-sided, double-sided or hard disk system, the instructions are clear and simple for setting up your disks.

The manual walks you through each step of setting up your disks to fit your situation, covering such items as cash or accrual accounting basis. The system is originally set up with specific accounts that you can add to (see Figure 2 for a list of accounts). You are, however, limited to a total of 60 accounts. You can change the account numbers to fit your individual accounting system needs.

The wide choice of printers that *Property Management* supports is impressive: the IBM matrix, Epson MX-70/80/100, TI 810/820, IDS 445/460/560, Anadex 9501, NEC 8023A, and the Okidata M-80. You may select a 14- or 8½-inch paper format. The key factor is the 132-column format



Suddenly the sweeping beams of your full screen radar pick up a barrage of incoming bombs. Manhattan (or *NINE* other cities) forms. You arm your weapon, ready to fight your way, tooth and nail. Oh no! The Lower East Side! Are your steel nerves rusting from too much caffeine? Only one more hit like that and... What? Someone's coming! Quick, press f5! *BOMBS OVER MANHATTAN* vanishes and a tiny, honest-to-god, functional *WORD PROCESSOR* kicks in. You weren't caught playing games this time. Whew! The crisis is over. Now you resume your defense. Whoops! There goes Manhattan. Was this the weekend you should've gone to Poughkeepsie?

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requirement. Choosing the 8½-inch paper format means that printing will be compressed. This isn't a problem because everything in the reports is still quite readable.

The last step in starting up the system is critical because it determines the maximum number of rental units and tenants the system can store and work with. You must choose between an "expanded" or "abbreviated" data format. Continental's use of these two terms is a bit misleading, but makes sense once you understand what is intended.

IT'S NOT easy to do something wrong when working with the helpful prompts and well-designed menus.

If you choose the expanded format, you will be limited to a maximum of 400 units for the 320K system; "expanded" means that you have increased the amount of information that can be stored about each property and tenant. With the "abbreviated" option, you can store an additional 100 units, but the information that can be stored for each unit is reduced.

The abbreviated format does not allow you to write "rental notes" for each individual property. Such notes would appear as more details about the units on reports and printouts. For commercial properties in this format you will lose a brief description line and the space for a note of whom to contact. You can include only one additional charge per unit, whereas with the expanded format you may include up to three additional charges.

From Module to Module

Once you have thought out and planned how you want to organize your property information and have initialized the program (as described above), you are ready to set up the database, which is the heart of *Property Management*.

The information about your properties is organized in the database at three levels:

Figure 2: Types of information that can be handled by each area of the Property Management program.

ACCOUNTS	PROPERTY	UNITS	TENANTS	REPORTS
Cash	Property Code	Rental Unit Code	Tenant Code	Property Report
Accts Receivable	Property Name	# Bedrooms	First Name	Rental Unit Report
Accts Payable	Street Address	# Bathrooms	Last Name	Tenant Report
Sec/Dep On Account	City	Fireplace	Telephone	Rental Status
Cln/Dep On Account	State	Children Allowed	Rent Date	Aging Report
Lastmo On Account	Zip	Pet (Y/N)	Generate Stmts (Y/N)	Vacancy Report
Rental Income	Residentl/Commercial	Furnished/Unfurnished	# Keys Issued	Transaction Proof
Misc/Late Chg Income	1st Trust Deed	Utilities	License #	Transaction History
Sec/Dep Forfeited	2nd Trust Deed	Parking Spaces	Current Payable	Income/Expense Report
Cln/Dep Forfeited	3rd Trust Deed	Wet Bar In Unit	Current Sec/Dep	Tenant Statements
Advertising	Holder	Notes (1 thru 3)	Current Cln/Dep	Mailing Labels
Auto & Travel	Amount	Type Code	Current Lastmo Dep	General Ledger Summary
Cleaning	Interest Rate (%)	Monthly Rent	Lease/Month to Month	
Commissions/Salaries	Term (Months)	Security/Deposit	Begin Date	
Gardening/Lndscaping	Monthly Payment	Square Feet	End Date	
Insurance	Unit Designation	Previous Rent	Tenant Since	
Interest 1st	Type (1 thru 5)	% Increase	Notice to Vacate	
Interest 2nd	Market Value	Date Changed	Base Rent	
Interest 3rd	Gen Ledge Dept #	YTD Rental Income	Description	
Janitor & Hauling	Auto Late Chg (Y/N)	YTD Vacancy Loss	Gen Ledger Acct #	
Legal/Accounting	$ or % Late Chg		Additional Mo Chgs	
Licenses	# Days Late		Gen Ledger Acct #	
Management Fees	Gen Ledger Acct #			
Carpentry;Etc				
Electrical Repairs				
Painting/Decorating				
Plumbing				
Roofing				
Misc Repairs				
Replacement/Supplies				
Taxes				
Telephone				
Utilities (Sqft)				
Write-Offs				
Depreciation Exp				
Parking Income				
Pool Income				
Kitchen Eq Rental				

property, rental units, and tenants. See Figure 2 for examples of the information stored at each level.

Setting up the information for a piece of property in the system is quite trouble-free; the program will lead you through a series of menus. Starting with the "Property Info Maintenance" menu, you first perform "Add A New Property." At this point you give the property a code, which is limited to six characters. In addition to the address you can include trust deed information, and up to five unit designations.

A unit designation is a prefix code such as APT # or SUITE #; the program automatically prints these codes to prompt you for responses. Under the unit designation you are allowed to list up to five type codes, such as 1BR, 2BR, and DLX, that identify the rental units. Additional information on property can include market value, automatic late charge codes, and general ledger details. A property file can be changed at any time; you can add a new piece of property by following the simple steps in the manual.

It's not easy to do something wrong when working with all the helpful prompts and well-designed menus. Even when you do make a mistake, it is simple to correct it. Whenever you get into a problem, such as by entering the wrong type of information, the program will give you a prompt showing how to get out of the improper situation.

Information about the rental units and tenants is just as easy to enter, delete, change and add to as the property information. From the main menu you can go to menus for "Rental Unit Info Maintenance" (RIM) or "Tenant Info Maintenance" (TIM). A rental unit can have a ten-character code. A tenant can have up to an eight-character code.

Through the RIM menu, you deal with the standard details about bedrooms, utilities, features (i.e. fireplace, pets/children allowed), furnished/unfurnished, and the number of parking spaces allowed. You can include up to three notes about the

Figure 3: Menu for "Enter Detailed Transactions" module (EDT).

```
&PROPERTY:BLDG 1                #DATE:03/01/81
                CONTINENTAL SOFTWARE
                PROPERTY MANAGEMENT
            ENTER DETAILED TRANSACTIONS

     ENTER COLLECTIONS
1 -      RENT COLLECTED                    (RCOL)
2 -      DEPOSITS COLLECTED                (DCOL)
3 -      WRITE-OFFS                        (WOFF)

     ENTER CHARGES
4 -      MISC. CHARGES                     (MCHG)
5 -      BAD CHECKS                        (BCHK)

     ENTER ADJUSTMENTS
6 -      DEPOSITS REFUNDED                 (DREF)
7 -      DEPOSITS FORFEITED                (DFOR)
8 -      CREDITS                           (CRED)
L - LIST/DELETE TRANSACTIONS
S - SELECT ANOTHER MODULE
X - EXIT FROM P/M PROGRAM

            ENTER DESIRED SELECTION?

&PROPERTY:BLDG 1                                        #DATE:03/01/81
                                CONTINENTAL SOFTWARE
                                PROPERTY MANAGEMENT
                            ENTER DETAILED TRANSACTIONS

     ENTER COLLECTIONS
1 -      RENT COLLECTED                                          (RCOL)
2 -      DEPOSITS COLLECTED                                      (DCOL)
3 -      WRITE-OFFS                                              (WOFF)

     ENTER CHARGES
4 -      MISC. CHARGES                                           (MCHG)
5 -      BAD CHECKS                                              (BCHK)

     ENTER ADJUSTMENTS
6 -      DEPOSITS REFUNDED                                       (DREF)
7 -      DEPOSITS FORFEITED                                      (DFOR)
8 -      CREDITS                                                 (CRED)
L - LIST/DELETE TRANSACTIONS
S - SELECT ANOTHER MODULE
X - EXIT FROM P/M PROGRAM

                        ENTER DESIRED SELECTION?
```

Figure 4: "Rent Collected" screen, selected from the "Enter Detailed Transactions" module.

```
          BLDG 1 ENTER RENT COLL (RCOL)

TRN       R/U       TEN COD       AMT        DESC
NO/CD   APT#          (DATE)              (G/L #)

R/U CODE:   APT#1_ _ _ _ _ _ (JONES)
              NAME: SAMUEL K. JONES
BAL/DUE =   $ 400.00        SEC/DEP =   $ 500.00
NO.RENT =   $ 400.00        CLN/DEP =   $ 100.00
RENT DATE = 03/01/81         LASTMO =   $   0.00
ENTER RENT COLL AMOUNT:                 $ 400.00
ENTER DESCRIPTION: RENT COLL
INCOME ACCT#: 4040 RENTAL INCOME

                        BLDG 1 ENTER RENT COLL (RCOL)

TRN                   R/U                 TEN COD                AMT                DESC
NO/CD   APT#    (DATE)                                                          (G/L #)

R/U CODE:   APT#1_ _ _ _ _ _ (JONES)
                                NAME: SAMUEL K. JONES
BAL/DUE =   $ 400.00                                    SEC/DEP =   $ 500.00
NO.RENT =   $ 400.00                                    CLN/DEP =   $ 100.00
RENT DATE = 03/01/81                                     LASTMO =   $   0.00
ENTER RENT COLL AMOUNT:                                             $ 400.00
ENTER DESCRIPTION: RENT COLL
INCOME ACCT#: 4040 RENTAL INCOME
```

unit for such things as "City View," "Single," "Fully Furnished," or "Refrigerator."

RIM also keeps track of such data as square footage, the amount of monthly rent, and the size of the security deposit and square feet. Previous rent, the percentage increase, and the date the rent changed are also detailed. There are even provisions for tracking the year-to-date rental income earned by the unit and any year-to-date loss due to vacancy.

A very professional touch found in RIM is the flexibility it offers in setting up the file to designate a property as residential or commercial. If you code the property as "R" for residential, the program asks you questions that would apply to an apartment building rented by individuals occupying rental units. If you had used the code letter "C," all the questions would be related to commercial properties, like offices and stores, which may be rented by companies that may or may not occupy the rental units themselves.

RIM includes a practical feature for use with complexes that have identical units. After defining one unit, you can specify that the next one has identical characteristics by typing the number 99 in response to a prompt for the number of bedrooms. The program then stores all the data you entered for the previous unit and moves you on to the next unit. The program is inconsistent in that there is no similar code for commercial complexes, which, after all, can be just as similar when it comes to identical units.

A very professional touch is the flexibility the program offers in setting up the file to designate a property as residential or commercial.

A Super Named TIM

Once the property and rental unit information is set up in the system, the only task left before getting down to a regular work routine is to set up the files of information on the tenants. This is done through the "Tenant Info Maintenance" (TIM) module.

Each rental unit is identified by one tenant code, which can be a name or number. Many property management offices would find this limitation to a single tenant code to be a real problem. It's quite common for two, three, or four tenants to share one rental unit, each paying rent separately based on the joint rental agreement.

The program is set up to allow you to enter rental payments by either the tenant code or the rental unit number. The convenience will quickly become habit form-

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Execution Speed *	6 s.	69 s.	8 s.
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Benchmark data based on EightQueens in "Algorithms + Data Structures = Programs" by N. Wirth (Prentice-Hall, publisher)

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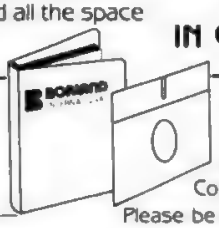
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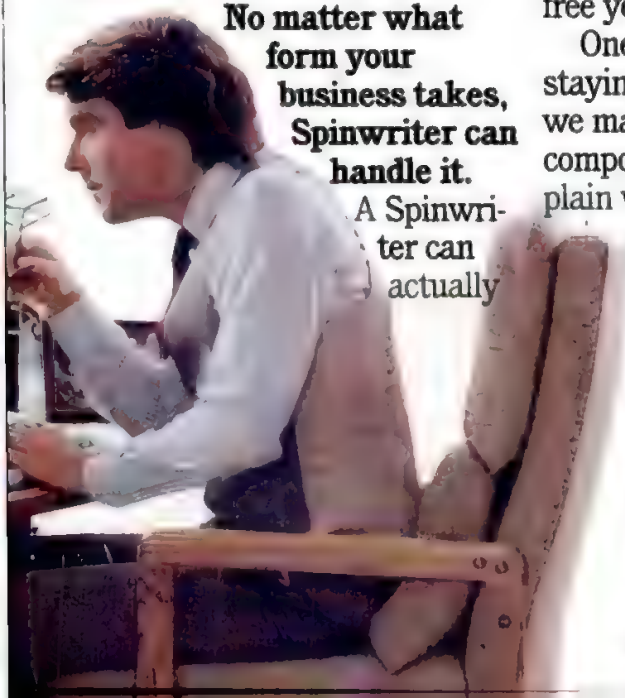
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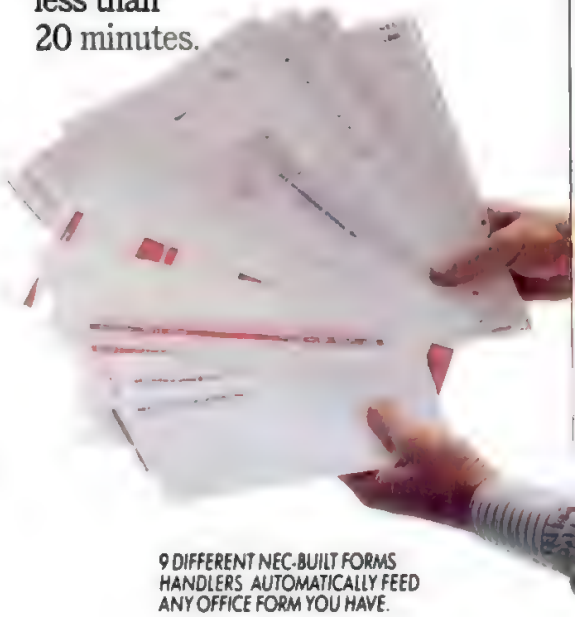
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ing. No more spelling out tenant names if you choose to use this feature.

The system keeps the standard information about each tenant, including rent date, base rent, additional charges, number of keys issued, deposits collected, and lease information, including notices to vacate. For commercial units there is a gross rent option, which determines the amount of rent due based on gross sales figures.

A Sample Posting

The *Property Management* program was designed to make initial setup of your files as trouble-free as possible, especially from the standpoint of converting your current records over to this system. Once the information has been entered, very little effort or aggravation is required to make adjustments for changes such as moving in a new tenant, setting up new units, or updating property figures.

The following sequence of events demonstrates how a common transaction is handled easily by the *Property Management* program. In this case, Mr. Jones in Apartment #101 of Building #1 pays his monthly rent of $400 on May 1.

You are assumed to have already posted fixed rents and late charges to all tenant accounts through the "Post Fixed Rents/Late Charges" module. From the main menu you now select the "Enter Detailed Transactions" option by typing in its code EDT.

Once you see a menu for the EDT module (see Figure 3) you select option 1, Rent Collected, since you want to enter the $400 collected from Mr. Jones.

The program then displays the "Rent Collected" file (see Figure 4) to allow you to enter the rent collected. First you must key in the tenant code or the rental unit code. An important feature of this program is that it allows you to enter the rental payments in any order you choose. This may sound like a capability that should be taken for granted; however, a number of other real estate programs require you to record each month's transactions in sequence. This is quite unrealistic considering that rent payments are much more likely to be received in random order each month.

All pertinent information about a tenant is displayed for you on the screen. At the end of the line labeled "Enter Rent Coll Amount," the cursor flashes under a

Figure 5: Rental Unit Information Report generated by the Property Management program.

RENTAL UNIT INFORMATION REPORT

PROPERTY BLDG 1
EVERGREEN APTS.
3685 ARTESIA BLVD
TORRANCE, CA 90504

GWL PROPERTY MANAGEMENT
4038 SOUTH STREET
HAWTHORNE, CA 90250

REPORT DATE 03 01 81 PREPARED: 03 01 81 V1.0 PAGE: 1

-- UNIT -- APT#	R/U TYPE	DESCRIPTION #BR	#BA (NOTE 1)	FPL	CHL	PET	F/U (NOTE 2)	UTL	PRKBAR (NOTE 3)	NOMINAL RENT RENT	SQ.FT RATE	SEC DEP	PREVIOUS PREV RENT	% INCR DATE	YTD RENTAL INCOME	YTD VACANCY LOSS
#1	SNG	#BR 1 (SINGLE)	#BA 1	FPL N	CHL N	PET N (FULLY FURNISHED)	F/U F	UTL WATER	PRKBAR 1 N (ROLLAWAY CORNER BED)	350.00	600 58	500.00	300.00 01 01 81	16.0%	0.00	0.00
#2	1BR	#BR 1 (REFRIGERATOR)	#BA 1	FPL N	CHL N	PET N (FULLY FURNISHED)	F/U F	UTL WATER	PRKBAR 1 N	400.00	800 50	500.00	450.00	14.3% 01 01 81	0.00	0.00
#3	2BR	#BR 2 (LARGE KITCHEN)	#BA 1	FPL N	CHL N	PET N	F/U U	UTL WATER	PRKBAR 1 N	500.00	1000 50	500.00	450.00	11.1% 01 01 81	0.00	0.00
#4	3BR	#BR 3 (TOWN HOUSE)	#BA 2	FPL Y	CHL Y	PET N (SUN PORCH)	F/U U	UTL WATER	PRKBAR 2 N	650.00	1200 .54	650.00	600.00	8.3% 01 01 81	0.00	0.00
#5	4BR	#BR 4 (BACK PATIO)	#BA 2	FPL Y	CHL Y	PET Y (DEN)	F/U U	UTL WATER	PRKBAR 2 Y (CITY VIEW)	1000.00	1500 67	1000.00	900.00	11.1% 01 01 81	0.00	0.00
		PROPERTY TOTALS								2900.00		3150.00			0.00	0.00

Figure 6: Tenant Information Report generated by the Property Management program.

TENANT INFORMATION REPORT
(INCLUDING RENT DETAIL)
GWL PROPERTY MANAGEMENT
4038 SOUTH STREET
HAWTHORNE, CA 90250

PROPERTY: BLDG 2
UNION BANK BLDG
12345 HAWTHORNE
INGLEWOOD, CA 90304

REPORT DATE: 03 01 81 PREPARED 03 01 81 V1.0 PAGE: 1

TEN CODE	SUITE#	R/U TYPE	TENANT NAME (CONTACT)	TELEPHONE (DESCRIPTION)	LEASE BEG END	#KEYS TEN SINCE	LIC #	TOT MO RENT	TOT DEP AMOUNT ?	--STATEMENTS-- ADDRESS
ACE	#1001	EXT	ACE MANUFACTURING CO ROBERT J. BOLLEN	(213) 804-1487 TOOL MAKER	MNTH MNTH	1 01 01 81	MANY	1500.00	500.00 Y	(USE PROPERTY)
						MO. RENT DESCRIPTION 1500.00 MO RENT				
ZETA	#1002	INT	ZETA PRODUCTS INCORP. ALBERT SELLERS	(213) 371-8654 PRNTING SUPP	04 05 80 04 05 81 04 05 81	1 04 05 80	MANY	2000.00	3000.00 Y	1234 MAPLE STREET TORRANCE CA 90710
			**NOTICE TO VACATE					MO RENT DESCRIPTION 2000.00 MO RENT		
SUPER	#1003	EXT	SUPERSOFT WARES JACK HOFFER	(213) 370-0048 COMPUTER S/W	05 10 80 05 10 81	1 05 10 79	MANY	800.00	1500.00 Y	(USE PROPERTY)
								MO RENT DESCRIPTION 800.00 MO RENT		
			PROPERTY TOTALS:					4300.00	5000.00	

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Figure 7: Rental Status Report generated by Property Management program.

RENTAL STATUS REPORT

PROPERTY: BLDG 1
EVERGREEN APTS.
3685 ARTESIA BLVD.
TORRANCE, CA 90504

GWL PROPERTY MANAGEMENT
4038 SOUTH STREET
HAWTHORNE, CA 90250

REPORT DATE: 03/31/81 PREPARED: 03/01/81 V1.0 PAGE: 1

TEN CODE	APT#	R U TYPE	TENANT NAME	MO RENT	CURRENT BAL DUE	BALANCES TOT DEP	LAST COLL DATE	CURRENT MO.COLL	RENT DUE DATE	LEASE EXPIRES	TELEPHONE NUMBER
JONES	#1	SNG	JONES, SAMUEL K.	350 00	0 00	600 00	03 05 81	350 00	03 01 81	01 01 82	(213) 723-8110
SMITH	#2	1BR	SMITH, SUSAN A.	400 00	0 00	1000 00	03 05 81	400 00	03/15/81	10 15 81	(213) 723-4937
THOMAS	#3	2BR	THOMAS, DALE M	525 00	0 00	1125 00	03 05 81	525.00	03 01 81		(213) 723-6001
VARGA	#4	3BR	VARGA, LISA P.	650 00 **OVERDUE**	360 00	0 00		0 00	03 15/81	03 15 81	(213) 860-2181
	#5	4BR	***VACANT***	1000 00							
			PROPERTY TOTALS:	2925.00	360 00	2725.00		1275.00			

value that's already filled in, based on how you set up your database. If that figure is correct, press the Return key and it is entered; otherwise, type over it with the correct value and press Return.

When you are through with a session of entering rents collected, the program asks, "Finished entering/editing transactions (Y/N)?" When you type Y for yes, the screen clears and then reads "Transactions have been recorded." You are then asked, "Do you want to print a proof listing now (Y/N)?" The proof listing is an optional "hard copy" record of what you have done.

To post Mr. Jones' rent payment you turn to the "Post Detailed Transactions" (PDT) module. As the posting functions are being performed, the screen displays exactly what is happening, with a heading above it reading "POSTING—DO NOT INTERRUPT."

A Range of Reports

The range of reports you can generate with this program is impressive. What's even more impressive is that you determine exactly what your reports will look like and how they will be printed.

The "Report Generation" module (RPG) can print the following reports: Property Report, Rental Unit Report, Tenant Report, Rental Status, Ageing Report, Vacancy Report, Transaction Proof, Transaction History, Income/Expense Report, Tenant Statements, Mailing Labels, and General Ledger Summary.

You have the option, at any time, to re-sort your database in order to print it out differently in the reports. This means that reports can be printed in alphabetical or numerical order, or with other variations.

There are probably more reports than the average property manager would ever need or use, but as long as the information is already in the database, it's nice to have the option of printing any number of complete and thorough reports. Dollar signs and commas would have been welcome on the reports, especially when you have to compare many figures. The commas help you scan through columns and rows with less confusion.

And speaking of commas, the strangest glitch in the *Property Management* program is that it never allows you to use a comma anywhere. The manual covers it this way: "You may not ever type in the comma (,) character, as it is not allowed anywhere in the *Property Management* System. For example, a company name like 'XYZ, Inc.' must be entered some other way, like 'XYZ; Inc.' "

THERE ARE more reports than the average property manager would ever need or use.

Examples of the quality of the reports are evidenced in the "Rental Unit Information Report" (see Figure 5); the "Tenant Information Report" (Figure 6); and the "Rental Status Report" (Figure 7).

Once you are finished printing reports, you are faced with an unwelcome challenge because the "Report Generation Menu" shows no instructions for selecting another module—not even one for exiting from the program to PC-DOS. If you rise to the challenge, you will discover that by pressing the Escape key you move back to the main menu.

Closing Out the Month

At the end of each month the "Process Month End" (PME) module will compress information into the "Transaction History File" for all properties. Afterward, the program zeros out all totals in anticipation of starting a new month; it will retain a few "needed" facts and figures, but delete everything else. Since this can be a dangerous point in the process if you haven't posted or printed reports for the previous month, a prompt reminds you to print a "Transaction History Report." After doing that, you will be directed toward the posting module, and other reports.

Following the process of closing out the month, you have the opportunity to transfer your records to a data disk for the IBM *General Ledger* software. As with all other aspects of *Property Management*, you are carefully walked through all the steps necessary to transfer the data, such as by the following prompt on the screen:

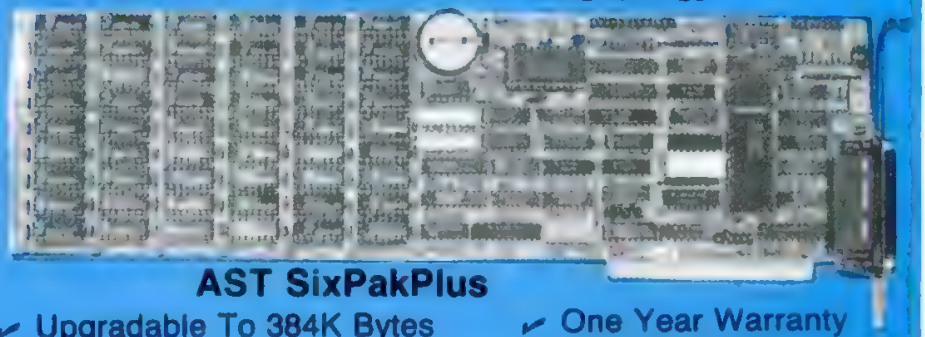
```
ENTER DRIVE FOR DISKETTE TO
HOLD THE IBM (PEACHTREE)
GENERAL LEDGER TRANSFER FILE:
B. MAKE SURE DISKETTE IN DRIVE
B: HOLDS THE CORRECT DISKETTE.
THEN HIT RETURN TO CONTINUE.
```

The process of closing out the month and transferring data to the *General Ledger* disk takes quite some time, so be prepared for a wait.

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Figure 8: A Quick Reference Guide to use of the **Property Management program.**

FUNCTION KEY USE

F1 - Record current values
F2 - Cancel all changes made
F3 - Not used
F4 - Not used
F5 - Change Current Property (can also be done with "&")
F6 - Change Processing Date (can also be done with "#")
F7 - Reset field being edited to original contents
F8 - Equivalent to Escape key
F9 - Backspace over character without deleting
F10 - Copy forward over next character

LATE CHARGE CODE -"$" for dollars and "-" for a charge expressed as percentage.

ENTER DATE - press Return key between month, day and year.

ESCAPE KEY - Easily moves you out of one module and to another by way of the Main Menu (Also use Escape key to exit Report Generation menu)

IDENTIFYING CODES
Property - 6 digits
Rental Unit - 10 digits
Tenants - 8 digits

DO NOT USE A COMMA ANYWHERE IN THE PROGRAM (including in company names).

NEGATIVE AMOUNTS - enter figures preceeded by a "-" (minus sign).

IBM BASIC WORKING - This indicates a function being performed in your system. The delay is 30 to 60 seconds and then everything returns to normal.

Learning from the Manual

The manual, on the whole, is well written. There are some minor flaws, such as the confusing explanation of the limits on the program's capacity that I mentioned earlier. The manual's author seems to have made an assumption that the user will read the entire manual from cover to cover and retain it all.

It is also assumed that the user already knows where everything is on the IBM PC keyboard. The omission of a keyboard diagram is a problem, because the keyboard is referred to quite often in the manual. A new user of the PC runs the risk of getting confused and lost. The manual adds to the user's confusion with the following statement (on page A4-1 under the "Operating Hints" section heading), which must be left over from the Apple II version's user manual: "To enter any input or menu selection, type the characters desired, followed by a -RETURN-. The word -RETURN- is used throughout this manual to symbolize typing the large key on your keyboard labeled 'RETURN.' "

In all fairness to George Lee, who wrote both the program and the documentation, the manual is logically organized and thoughtfully written. Its index is exceptionally helpful, as is the table of contents. The colorful tab dividers for each section add convenience when searching for information.

Using *Property Management* would have been much easier for me if the "Operating Hints" section of the manual had been compiled into a quick reference User Guide on a single sheet to have by the computer while using the program. The quick reference I put together for myself (see Figure 8) has proven quite useful.

The manual gives in-depth coverage of the menus and their use. The menus have a nice consistency in that the same keys are used for the same functions throughout. For example, the S key is always used to "Select Another Module" (i.e. go from posting to printing). The X key is used to exit the system. When exiting the system, you receive the following message across the screen:

```
                END OF SESSION
DON'T FORGET TO BACK UP YOUR DATA
DISK!
```

The words "BACK UP" flash for extra emphasis.

I can think of one major improvement in the format of the menus. Instead of devoting almost the entire left hand side of the menu screens to graphic representation of Continental's "C" logo, that space could have been devoted to listing function key assignments and reminding users of the effect of the Escape key.

The function keys are used well, although F3 and F4 aren't used at all. Those two function keys could have made it easier to correct what you have entered if they had been assigned instructions that allowed you to go forward or backward through the data field. As it is now, you can't correct or change an entry until you have completed all input.

PROPERTY Management is especially useful when it is tied into an accounting package.

Function keys F5 and F6 are implemented most frequently. F5 allows you to quickly change from property to property within the database. F6 is used to change the current processing date. This is one of two dates you work with in the program; "today's date" is the other.

Numbers can be easily entered with the numeric keypad; the manual never explains that the keypad is activated with the NumLock key—another assumption of the user's previous knowledge.

Meeting the Manager's Needs

The performance of the *Property Management* program is impressive and useful, especially when it is tied into an

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accounting package. The limit of 25 properties in the system might not be a problem for many property management firms, but larger operations will find that time sharing or owning a larger system is more suited to their needs.

The kinks and glitches of the *Property Management* program are varied and result in inconsistencies, many of which, no doubt, are caused by "carry-overs" from the version for Apple II. The slow response time between modules shows that the program doesn't take advantage of the PC's advanced features the way Lotus Software did with its *1-2-3* program.

The inconsistencies are puzzling. From time to time the program simply stops functioning. It displays the following message on the screen: "IBM BASIC WORKING." The manual doesn't really explain what it means, except to repeat that IBM BASIC is working.

Continental Software clearly planned for the future in this program by allowing for 9-digit zip codes. However, most property managers would be more interested in keeping track of units where the rental price varies throughout the year, such as with vacation and college rental units, than they would be with the zip-code feature.

When it comes to dollars and cents there are two areas where the *Property Management* program needs to be improved. First, in this day and age of variable interest rates, information about trust deeds changes often enough so that a program needs to allow for such changes.

Second, no mention is made of recording a property manager's fee or commission with *Property Management*. While such figures can easily be included in the program's reports and records, the manual never addressed this subject, which is most near and dear to the hearts of all property managers. Fees and commissions keep them successful enough to afford to buy software and IBM PCs.

The manual wisely recommends that you continue running your current system—whether on paper or with a time-sharing service—along with the *Property Management* program until you are absolutely confident and comfortable with using this program.

Though the price of $695 seems a bit high for a microcomputer program, it is well worth it in terms of saving time, simplifying monthly routines, and adding a more professional, polished look to a property management firm. */PC*

Bil. Alvernaz is executive director of the Santa Barbara, California Board of Realtors.

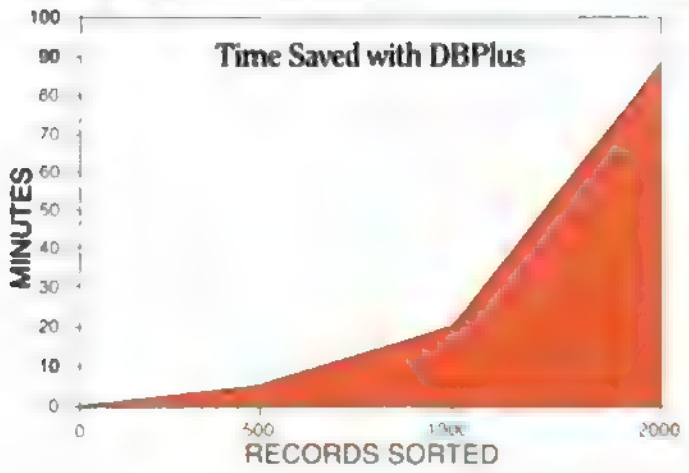
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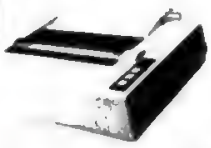
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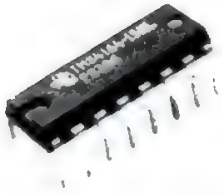
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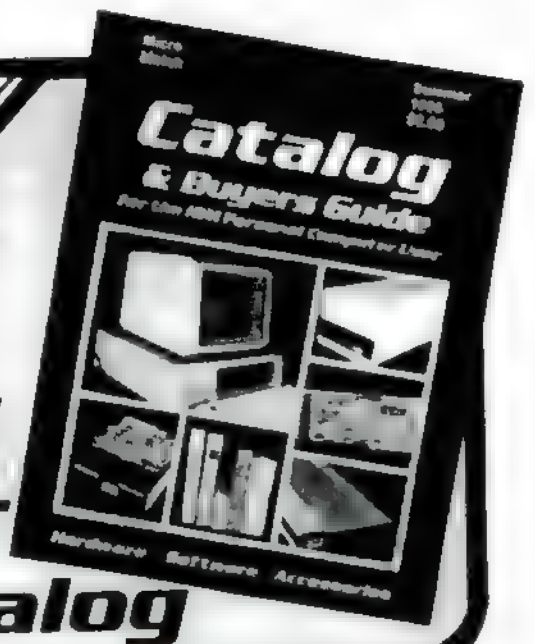
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Warding Off Evil Spells

We half moved into a new error when it comes to writing. Eye just got too new spelling checkers and be leave you me they are something two sea. The first veneration, like *Spellguard*, took yore text & when threw it awl & found all the arrears and then showed them too you won at a thyme so ewe could mark them up and then use your word processor to fix them. The second Wave, including *The Word Plus*, worked almost the same way, but actually took care of the fixes if you tolled it two.

These new ones do there work "on the fly" & show yew yore text as yew go. Every time they come to a word they don't no, they stop and tell ewe and let you fix it right there on the spot. If you knead two, you kin even edit yaw stuff some.

Some peephole will say this is wonderful. Others will yon. Me, I say it all depends. Hear oar the two I tried.

Word Proof
IBM
P.O. Box 1328-C
Boca Raton, FL 33432
(305) 998-2000
List Price: $60
Requires: 96K RAM, two disk drives (one for all features but synonyms), PC-DOS.

CIRCLE 657 ON READER SERVICE CARD

Word Proof might aptly be called a text polisher—a tool you use to buff up the shine on what you write. It's a good spelling checker with one of the biggest dictionaries around; 125,000 words is the claim, though I didn't count them. It's also a first-rate thesaurus and a dandy anagram finder. As if that weren't enough, it's also a rudimentary word processor. You suspect the 60-buck pricetag must be a typo. It's not. It's a genuine bargain.

Word Proof works with standard DOS or close-to-DOS files, including those you get from *PeachText*, *EasyWriter*, *The Final Word*, and *Volkswriter*, among others. You may have to adjust the onscreen margin settings carefully to avoid weird displays with files that use carriage returns as line terminators. *Word Proof*

pointedly excludes *WordStar*, unless you use a program to strip out all its word-ending high bits. That's a real pity, because this program is a winner.

WORD PROOF isn't, and doesn't claim to be, a serious word processor.

Loading Up

To start *Word Proof*, you select the kind of display you want, then choose from a six-dish menu. *Word Proof*, annoyingly, always comes up with the current drive as its default, and it's one of the few you can't change. To load a file, you type in the filename or you can choose the directory option. A full directory with sizes, dates, and times appears, and you select a file to work with simply by moving the cursor to its name and hitting Alt-E.

Your text fills most of the screen. One status line at the bottom lets you know what file you're working on, the ASCII number of the character above the cursor, the cursor position by line and column, and whether you're in insert or replace (overtype) mode. The other status line lets you know where to get help—namely, from the F1 key.

Pressing F1 instantly puts a boxed function key menu smack dab in the middle of the screen, as though it were pasted on top of your text. It's distinctive and attention-grabbing, and it's the way most menus and other ephemeral items come up in *Word Proof*. Four similar menus are available with additional presses. Since operation of this program is extremely simply—there's even a little paper template to put around the function keys—you'll hardly ever need the extra help. It's there if you do.

To enter or edit text, just type away. *Word Proof* wraps words at whatever margin you select (up to 165) and automatically reformats paragraphs onscreen. The keys on the cursor pad work logically in their unshifted modes. Ctrl-Home or Ctrl-PgUp takes you to the beginning of the file, Ctrl-End or Ctrl-PgDn to the end. The tab and backtab move you eight characters in either direction.

You can insert blank lines with F7, move the cursor forward by word with F8, erase to the end of the current line with F9, and do simple forward search-and-replace operations with F6. Alt-F9 is an "undelete" key, but it only remembers the last character or line deleted. You can print the document with left or right margins from zero to 164, choose a page length from 0 to 150 lines, and put control characters anywhere in the text.

But that's all, folks. *Word Proof* isn't, and doesn't claim to be, a serious word processor. It lacks scads of features—everything from underlining, boldface, and subscripting to the simplest types of block moves. Where *Word Proof* shines is as a court of last resort for tired text.

Magic Spells

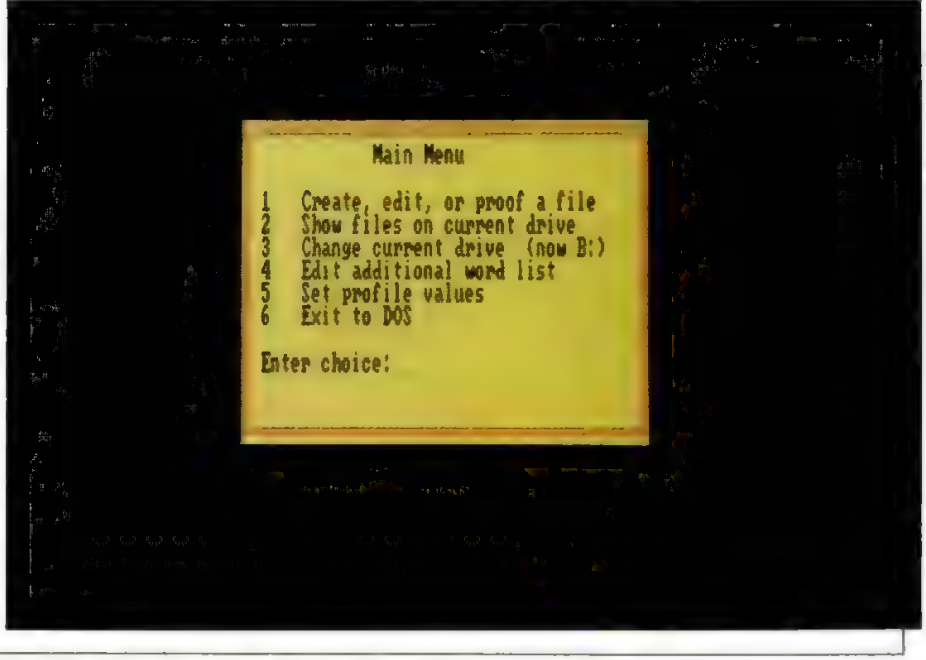
Spelling confirmation is available word by word or globally. Put the cursor over any letter in a word and hit F3, and *Word Proof* will confirm or deny that the word is kosher. Hit F2, and the program scans forward from the cursor position, hunting for errors. When it finds one, it highlights the suspect word and displays a four-choice box menu. You can ask for a list of possible spellings, ignore the marked word, tell *Word Proof* that the word is spelled correctly and to remember it, or tell the program to remember the word but stop the spelling check.

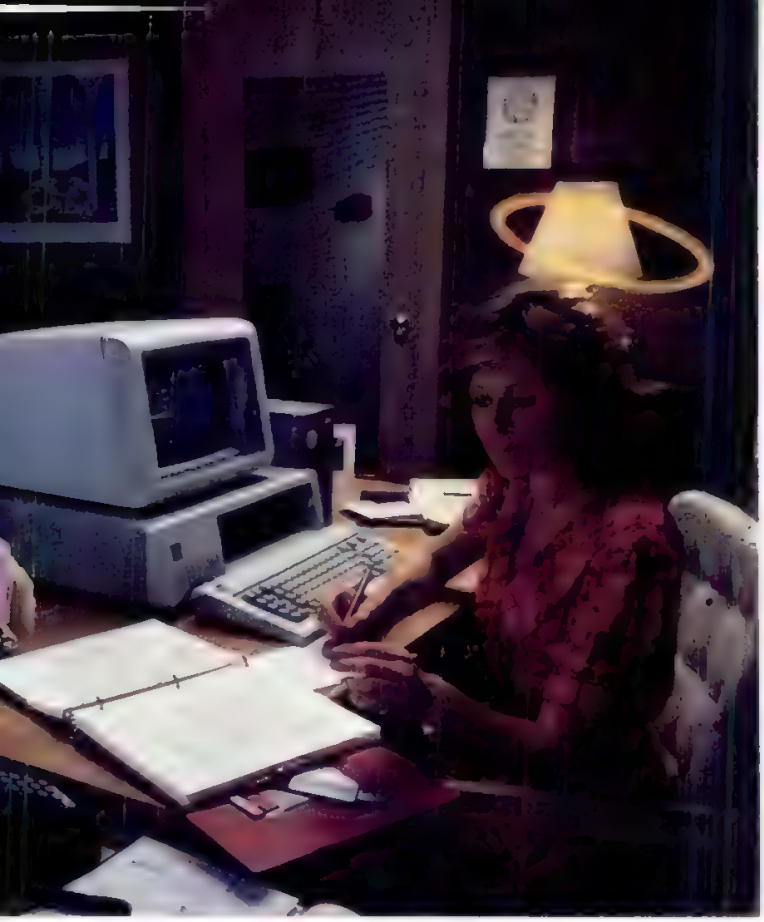
If you take the first option, the disk spins awhile and you get a short boxed list of potential replacements. If the right word is there, you use the cursor keys to select it. Hitting Enter puts the replacement in the right spot. If none of the suggested alternatives seems reasonable, exit to the editor by hitting Esc and then type in the proper word yourself. This is mildly irritating since the cursor always appears at the end of the suspect word, and you have to back up to correct it.

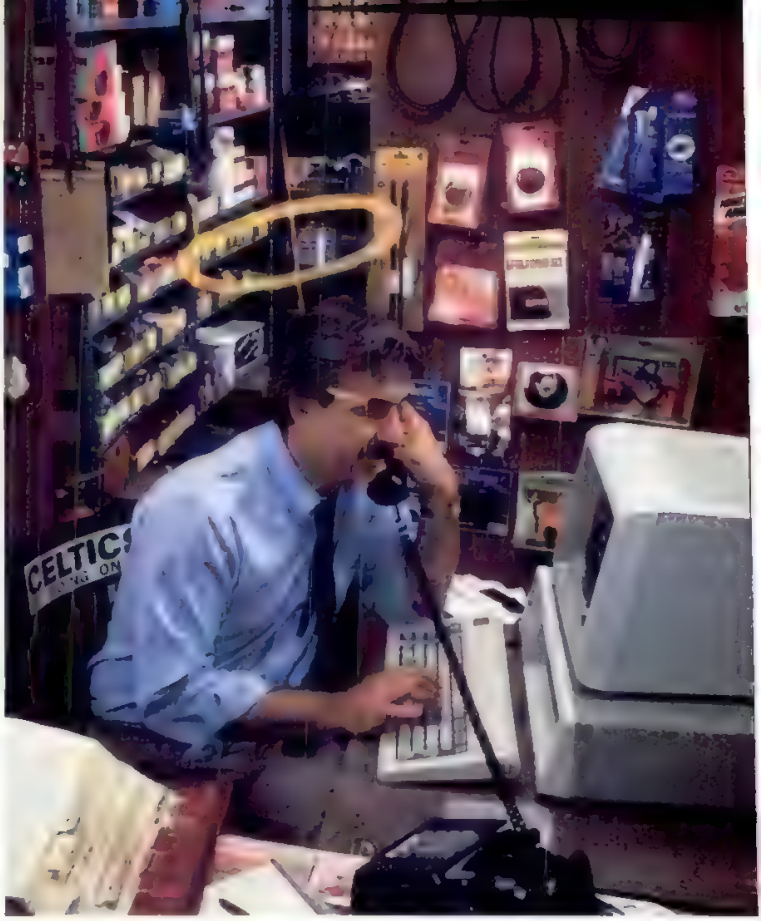
Word Proof will put the words you tell it to remember during a given session into a file called WORDPRF.ADL, which it reads each time it loads. You can edit this file with *Word Proof*, too, adding and deleting at whim, though your changes won't take effect until the next time you invoke the program.

Unfortunately, this file has a stingy limit, 6000 characters, or about 600 words, which is awfully small, considering you have to enter both singular and plural forms if you want both to be ignored in the future. If you want to update it with the words you've found in a given session, you have to remember to save the new file before you exit to DOS. You may keep alternate versions of the file for special uses—a particular series of articles or legal documents, for example—but every

The main menu of Word Proof.







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CIRCLE 356 ON READER SERVICE CARD

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WORD PROOF is most likely to be fooled if you accidentally stick an extra letter in a word.

copy must be called WORDPRF.ADL. Luckily, you can specify that the program look to your document disk for this file.

The spelling checker works well. Words appear to be carried in the dictionary in their complete forms: the program caught *mooses, mouses, mens, womens,* and *childrens* in my test file. It also catches odd capitalizations (SHift kEY ProBlems). The proposed alternative spellings surprisingly often include the word you meant. I discovered that the program is most likely to be fooled if you accidentally stick an extra letter in a word; with occasional exceptions, the alternatives tend to be at least as long as the suspect term. Another gripe: it's a bit easier than I would like to proof part of a document and accidentally skip the rest. But this program is as good as any I know at warding off evil spells.

Another Word for Terrific

The synonym list is delivered on a separate disk from the master, but it fits nicely with the rest of the program on one double-sided disk—something the manual doesn't bother to mention. When you put the cursor on a word and hit F4, *Word Proof* highlights the word, loads the list and puts up a box full of synonyms. It's smart enough to move the word up if it falls underneath the "paste-on" box.

With a floppy disk, the delay after pressing F4 can amount to nearly 12 seconds. Putting the synonym list on a disk emulator cuts the maximum wait to about 2 seconds, faster than even the most nimble-fingered could page through *Roget's International Thesaurus*. To substitute a synonym for the highlighted word, you move a cursor through the list to the word you want and hit Enter, just as you correct a misspelling.

The program is not chintzy about the synonyms it delivers, either. It came up with 36 for the word *thing*, including such surprises as *forte* (as in "It's his thing") and *fixation* ("She has a thing about him"). Although a quick check against *Roget's* revealed the book to be significantly more comprehensive than the disk, I was pleased with the synonym program's scope.

I was delighted to see that it's completely cross-referenced. Some thesaurus programs on the market allow you to access their entries only from the commonest words, which is a severe limitation. If you look up *wonderful*, for example, you may get *marvelous* and a host of other alternatives, but if you look up *marvelous*, the program might not give you anything at all. As far as I can tell, *Word Proof's* list can be accessed from any word in it, which makes it exceptionally powerful.

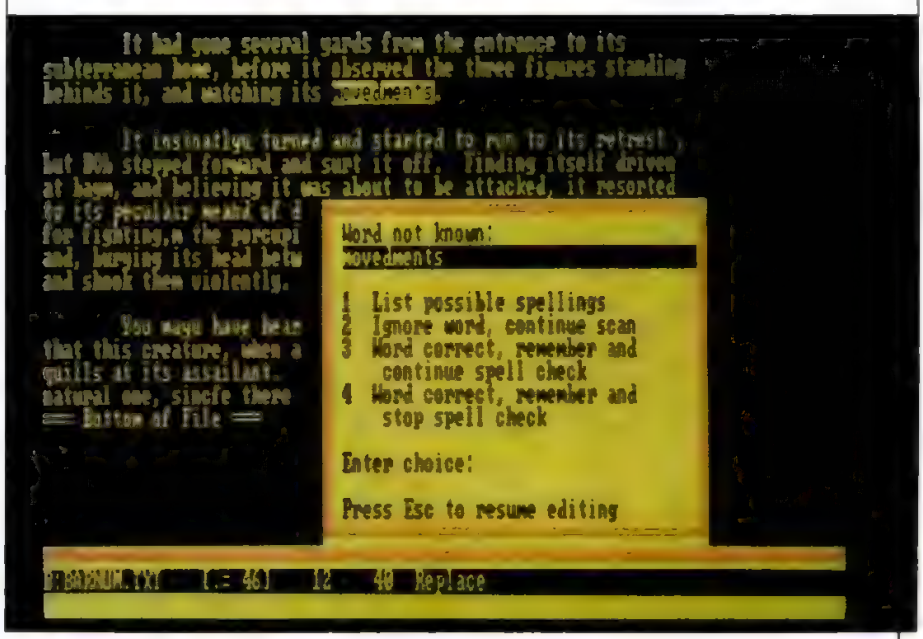
There are a couple of problems, though. *Word Proof* is fooled badly by irregular forms of common words. *Pay* has nearly forty synonyms. *Paid* has none. To get the synonyms you want, you have to type in *pay*, replace it with a word from the list, turn it into the past tense, and then delete *paid*.

Though it will usually find the synonyms for words with regular past tenses and plurals, *Word Proof* won't deliver the word list in the past or plural form. If you ask for synonyms for *battles*, you'll get *struggle*, among others. If you accept one of the synonyms, it will go into your text in the singular form. It's easy enough to add the suffix yourself, but letting the incorrect substitution pass without noticing it is even easier.

HITTING Alt-A gets you an anagram for the word at the cursor position.

Sometimes you get so many synonyms that they fill more than one screen. A message telling you to use Pg Up and Pg Dn for more words appears, but not in the box of words. It's down in the status line, where it's easy to miss. If you're working with single-sided drives or a two-disk version of *Word Proof*, you have to remember to remove the synonym disk from the drive, or you're liable to save a file to it. Write-protecting it is a good idea. But all in all, this thesaurus program is terrific.

Word Proof is used to check text for mispellings. After pressing function key F2 to request the spelling checker, a menu appears when the program finds a questionable word, such as "movedments." Note that Word Proof failed to point out the word "behinds," which is incorrect in this context.



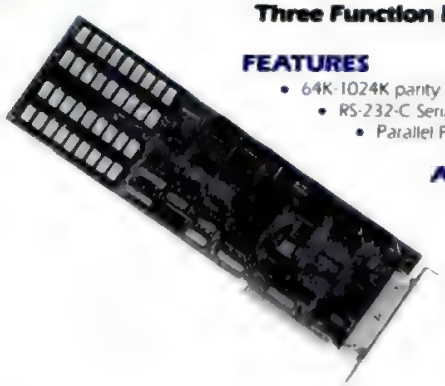
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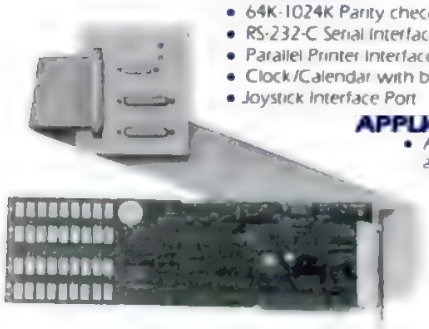
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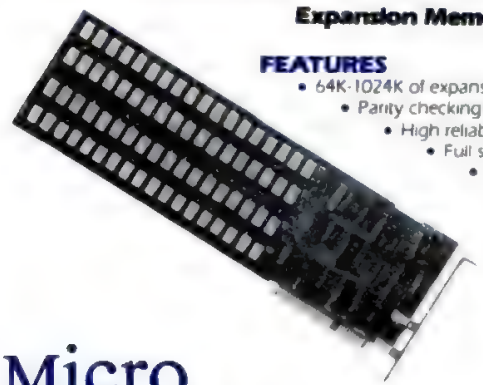
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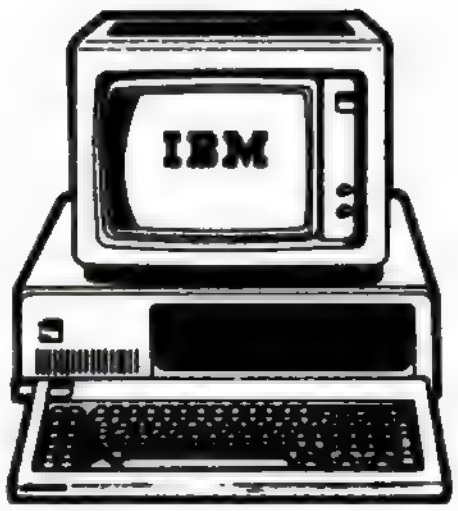
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Cute and Customized

A couple of *Word Proof*'s features qualify as "cute." Hitting Alt-A gets you an anagram for the word at the cursor position. Alt-R duplicates the current line. Alt-M toggles paragraph markers on and off. If you've got a color display, you can customize ten different items, from the text screen foreground and background to the box lines. You can also change and store a wide variety of other defaults.

IF ONLY Word Proof worked with WordStar, I'd hug it.

Error trapping is good. If you try to exit the program before saving a modified file, *Word Proof* warns you and gives you a chance to recover. The program does not automatically save your original file as a backup, but it's easy to save it with a different filename from the original. An illegal filename fooled but didn't crash the program. *Word Proof* simply truncated the name at the illegal character. Speaking of crashing, the program disks aren't copy-protected, and you're encouraged to make backups.

The manual is regulation IBM-in-a-box, in tutorial-plus-reference form. The basic instructions are clear and step you through the program with a learn-by-doing approach, but certain limitations of *Word Proof* aren't documented. There's an inadequate index (the undelete key is referenced only under Alt-F9), an apparently complete list of messages (though how in the world "blank screen," a condition caused by improper selection of display options, can be called a message is beyond me), and four pages that cover about 25 "commonly misused words" in some detail. A longer list would have been more useful to abusers. There's also a demo file on disk, Patrick Henry's "Liberty or Death" speech.

The manual's material on other editors and word processors covers in detail only the ones that come in IBM boxes. Though this material is reasonably thorough, it's less than clear. It does supply a list of non-standard special characters and words; problems can be avoided by entering them in the "profiles" menu and the additional word list. The manual explains what happens when the file is too big to fit into memory (a "spill file" is created on disk) but there's no indication of how big is too big. Nor is there any discussion about using the program on hard disk under DOS 2.0. I'm told it does work when all the files in question are in the same directory, but I wasn't able to test whether the program can hide out elsewhere and still work.

It would probably be nice to have a list of the anomalies *Word Proof* accepts and rejects in one easy-to-find place. As things stand, the information is sprinkled through the manual and is not always easy to locate. Apparently the program accepts all single characters as words, passing *W right Brothers*; it considers hyphenated words as whole words (although this can be defeated), so you should run it before running a hyphenation program. And *Word Proof* ignores numbers, so *9dog* is legit as far as it's concerned.

But *Word Proof* still goes to the head of my list for users of compatible word processing programs. It's easy, it's fast, it's got plenty of features, and it's a mere 60 bucks. If only it worked with *WordStar*, I'd hug it.

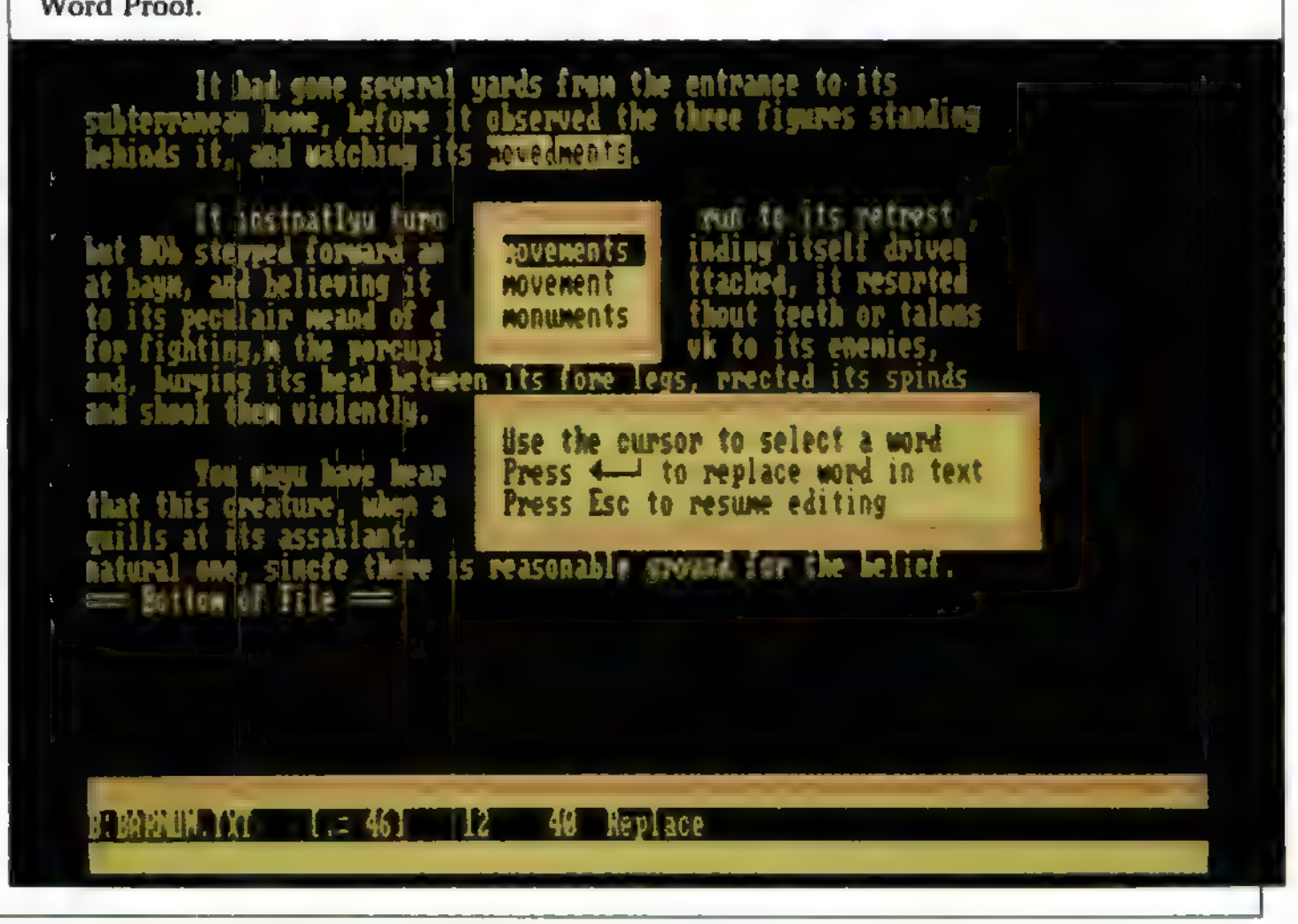
VisiSpell
VisiCorp, Inc.
2895 Zanker Rd.
San Jose, CA 95134
(408) 946-9000
List Price: $225
Requires: 128K RAM, PC-DOS, two disk drives, 80-column monitor.

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After you've seen *Word Proof*, or any other decent spelling checker, the asking price for *VisiSpell* seems utterly outrageous. Although *VisiSpell* is by far the most expensive spelling checker I know of, it doesn't even offer a thesaurus.

It does catch duplicated words ("the boy fell in the the lake") and odd capitalization (SHift KEy GOofs). It claims to work with *VisiWord* documents and DOS text files, but the *PeachText* and *Word Proof* DOS files I tried caused weirdness on the screen and disaster in the files. Apparently *VisiSpell* won't work properly with lines longer than 255 characters, and many programs store paragraphs as very long lines. My guess is that *VisiSpell* can handle only DOS files that use carriage returns to mark the ends of lines. It seems to work adequately with *WordStar* files, but VisiCorp offers no guarantees.

After pressing the number 2 key to request possible correct spellings for "movedments," windows with instructions and a list of suggested words are superimposed on the text by Word Proof.



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VisiSpell is copy-protected, but it can be installed on a hard disk. The manual implies that the *VisiSpell* files must be resident in the same directory as the text file to be processed. Disk emulators can't be used to soup up performance. Color is available with color monitors, but you're stuck with the colors VisiCorp provides.

VisiSpell can load directly from *VisiWord*, but only by doing the internal equivalent of a three-key reboot, wiping out any disk emulators and keyboard enhancers you may have installed. If you exit *VisiSpell* with the *VisiWord* option, it loads the last file proofed into the word processor without rebooting the system.

Secret Invocations

The manuals tell you to do a keyboard reset to start it up, but I'll let you in on a little secret: you can invoke *VisiSpell* with the magic letters VS. Once you invoke the program and it loads, it prompts you to insert the dictionary diskette. Then you're ready to begin.

VisiSpell uses the one-line menus VisiCorp loves so much. The options appear across the screen in no particular order, and you can select them either by moving a highlighted cursor to the option and hitting Enter, or by selecting the first letter of the option. I find this approach irritating because of the illogical order of the menus and chosen defaults. The default option at startup, for example, is Proof, which is what you obviously want to do. But if you select it, you get an error message: first, you have to load a file. With *VisiSpell* you can essentially forego the cursor and stick with the single-character commands, most of which fall under the fingers of the left hand.

VISISPELL uses the one-line menus VisiCorp loves so much.

When *VisiSpell* smells something suspicious, it displays a dozen lines of your text in a window at the top of the screen and highlights the questionable word. The current spelling is repeated below, along with an alternate spelling. You may tell the program to accept the current spelling or the alternative, to search for another alternative, or to let you type in a correction. If you do type in the change, *VisiSpell* checks your spelling in its dictionary and asks for your confirmation if it can't find a match. You may also mark a questionable word with any other character you choose (# by default) so that you can find it in the document later on.

By hitting the Escape key, you can move the cursor into the window and do some rudimentary editing with the arrow, backspace, insert, and delete keys, F6 for deletion to end of line, and F9 to undelete. Unlike *Word Proof*, *VisiSpell* lets you work only in the neighborhood of words it finds suspicious. You can't move the cursor blithely through the text if you remember something you want to fix elsewhere.

Except when using the editing screen, you're always asked to choose whether a correction is to take effect for the whole document, for the current word only, or for the foreseeable future. Once you get underway, you can save a keystroke by using the F2 key to repeat the choice you made for the previous word.

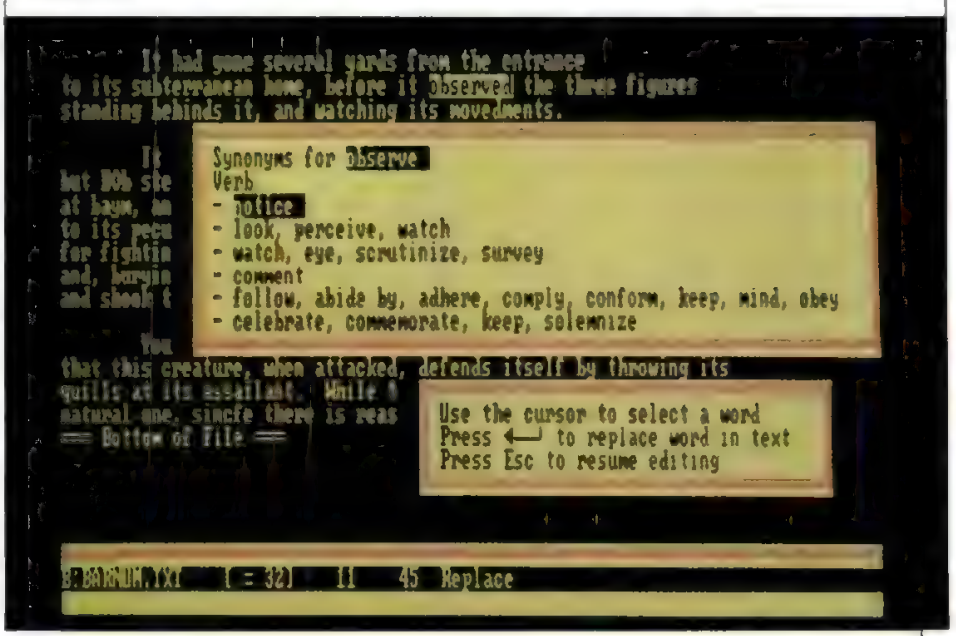
Master and Personal

VisiSpell uses two word lists: a Master Dictionary of over 100,000 words, and a constantly-changing Personal Dictionary—initially part of the Master Dictionary—with 15,000. When you select the Add-to-Dictionary option, the words you add replace some of the words in the Personal Dictionary. When you save a Personal Dictionary, it goes onto the document disk; there's no way to keep a modified dictionary on the program disk. You can maintain different versions of the Personal Dictionary by saving them in files named PERSONAL.XXX (XXX being any legal extension), and you can add words to and delete words from a Personal Dictionary by using the Modify-Dictionary option.

VISISPELL lets you work only in the neighborhood of words it finds suspicious.

Unlike *Word Proof*, *VisiSpell* is smart enough to propose alternate spellings that result from breaking a misspelled word in two, such as *pose an* for *posean*. But *VisiSpell* proposes only one alternative at a time, and there's often a wait even for that one. During the wait, the message

The synonym function of Word Proof is used here to display alternatives to the word "observed."



"... thinking ..." flashes in the place where the alternative will appear. If it's not the right one, you have to tell it to look for another. The search can be hastened by a neat programming trick: the program goes out and looks for the next possibility while you're deciding what to do. It's the only time I've seen this technique implemented in PC software, and it's eminently sensible. After all, the user is a lot slower than the machine.

THE frequent wait for an alternate spelling is annoying, especially when the program fails to find one.

Unfortunately, the implementation leaves a lot to be desired. Alternate words are presented only from the Personal Dictionary. The only way you can get at the words in the Master Dictionary is to use a strange option called the "Type-in" menu, using search characters (up to four) to generate a word. The search characters are "?" standing in for all the letters of the alphabet, plus apostrophe and hyphen; "*" checking all the above as well as a null character in that position; "," standing in for just the vowels; "/" replacing only consonants; and "." replaced by the null character and the character to the left of the period, thereby checking for double letters. Even with a help screen available—but only before, not while, you're typing in the name—this cockamamie scheme seems so unwieldy that I can't imagine anyone ever bothering to use it. Fun to try it and watch the display spin through the possibilities, though.

My Default or Yours

Many of *VisiSpell*'s features can be customized for specific needs. You can have it prompt you every time it reencounters a word you've already changed (the default), or you can have all subsequent changes made automatically. By default, the program will pause briefly after each correction to let you exit to the editing mode. You can have it check hyphenated words as single words (*bottle-necks* would be flagged) or as two separate words (*bottle-necks* would be passed). If you're doing an outline, for example, *VisiSpell* can be set to ignore single characters.

VisiSpell flags repeated occurrences of words (like *this this*), but you can tell it not to. It finds words with nonstandard capitalizations (like *VisiSpell*), but you can disable that feature for those articles you write about microComputer softWare. You may also choose the amount of text displayed within a range of two and 16 lines. According to the manual, the fewer lines displayed, the faster the checking.

Are You Mens or Mouses?

I used the default version of *VisiSpell* to check a long text file and found it irritatingly slow. When it finds a word that has out-of-kilter capitalization and that isn't in its dictionary—like *WordStar*—*VisiSpell* makes you deal with the word twice: once for capitalization and once for spelling. The frequent wait for an alternative spelling is annoying, especially when the program fails to find one. If I used the program regularly I would almost certainly turn off its checking of single characters and its pause for editing.

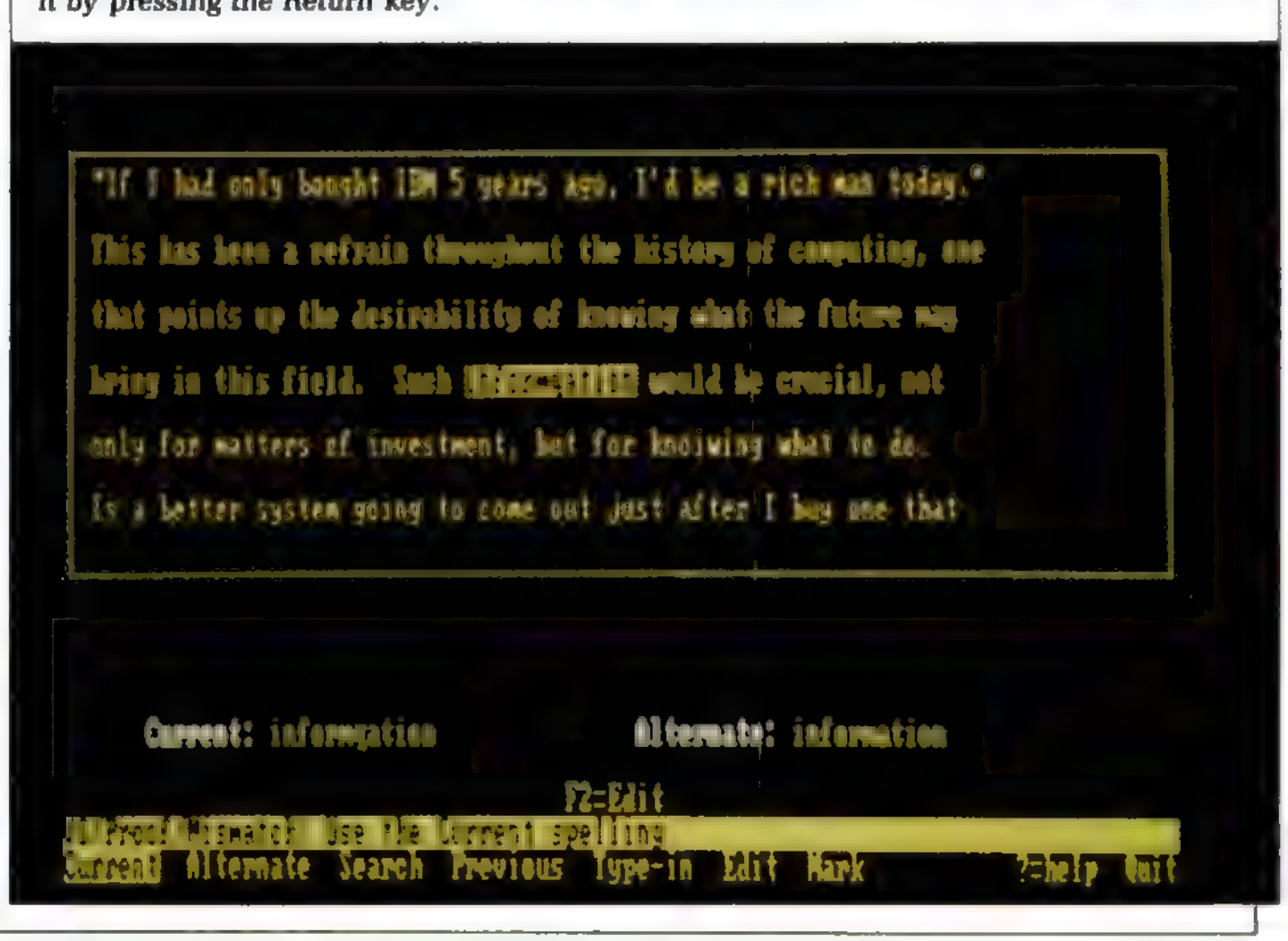
In my quick and dirty test, *VisiSpell* did catch *mooses*, *womens*, and *childrens*, but passed *mens* and *mouses*. (Perhaps VisiCorp is committed to the *mouses* for its VisiOn peripheral.)

The most annoying feature appears when you finish the job. You're prompted with the question, "Save corrected document and rename original copy?" If you pick yes, *VisiSpell* renames your original file FILENAME.SBK and its corrected file FILENAME. And if you pick no? Sayonara, sucker. *VisiSpell* blithely trashes the corrections you've just labored on and restores the original file.

The manual comes with a setup guide and a "QuickStart" course that uses a sample on disk and quickly gets you up and running. The manual is indexed but leaves out such crucial information as how to save your final proofed document.

Strangely enough, *VisiSpell* won't proofread headers and footers of *VisiWord* documents. There's also some confusion about how it handles character attributes like underlining in those documents. If you don't make your corrections in a manner the program approves of, you can apparently wind up with a word that's underlined except for the character you corrected.

VisiSpell has discovered an error in the text: the word "information." An alternative is proposed as the correct spelling. Actions are proposed at the bottom of the screen. You use the right and left cursor keys to move the highlighting onto one of them, then select it by pressing the Return key.



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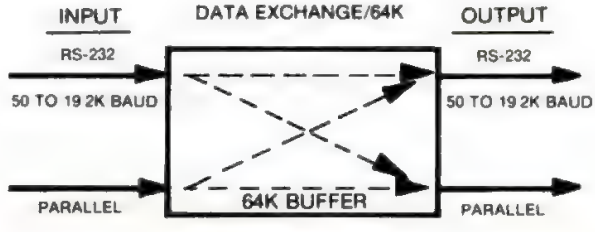
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ANY OF these programs can do a creditable job of catching your typos.

How Do You Spell Winner?

I've been using *The Word Plus* as a final check on my copy for the last year or so. Its major drawbacks are a slow word lookup, a small (45,000 word) dictionary, the inability to show you more than one line of the context for each correction, and some difficulty in correcting certain kinds of mistakes—those involving capitalization or broken words—from within the program. On the other hand, *The Word Plus* offers an indispensable word count utility, a homonym helper, an algorithmic hyphenation program, a word frequency analyzer, and a few other goodies. One important thing it does that neither *Word Proof* nor *VisiSpell* can do is automatically mark text that has increased or decreased the width of a line. I don't use that feature much, but it's indispensable for users of programs like *WordStar* who want to keep justified lines even.

I tried a 21,000-character file with all three programs. In its default mode, *VisiSpell* took nearly 20 minutes to complete the job; *Word Proof* and *The Word Plus* took about 12 each. Admittedly, those times are subjective and partially reflect my speed at handling them, but I think the relative times are fair. Installed on a disk emulator, *Word Proof* and *The Word Plus* would both have run significantly faster, as would *VisiWord* if it had been configured somewhat differently and run from a hard disk.

If you hand them files they can live with—and *The Word Plus* seems by far the most amiable in that regard—any of these programs can do a creditable job of catching your typos. *VisiSpell* also can do a marvelous job of diminishing your bank account. But the synonym finder, the large and fully accessed dictionary, the ease of use, and the low price of *Word Proof* make it my clear favorite.

Remember, though, spelling check hers cant fine every thing. */PC*

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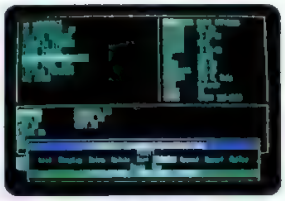
OPEN ACCESS takes its name from the source of its power—a relational data-base manager that gives you access to more data in more ways than any comparable software.

OPEN ACCESS includes an electronic spreadsheet, 3-D graphics, word processor, appointment scheduler and telecommunications module—all revolving around the powerful information manager.



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1



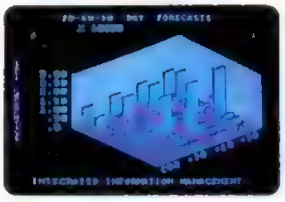
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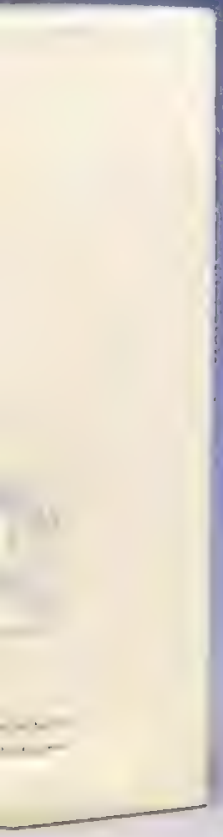
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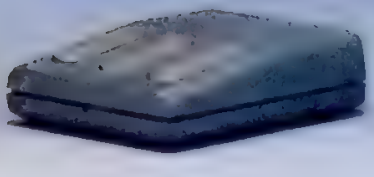
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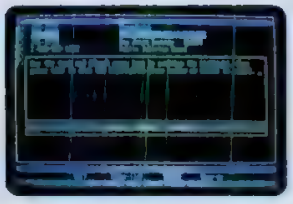
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4



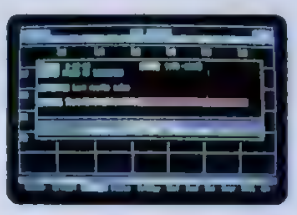
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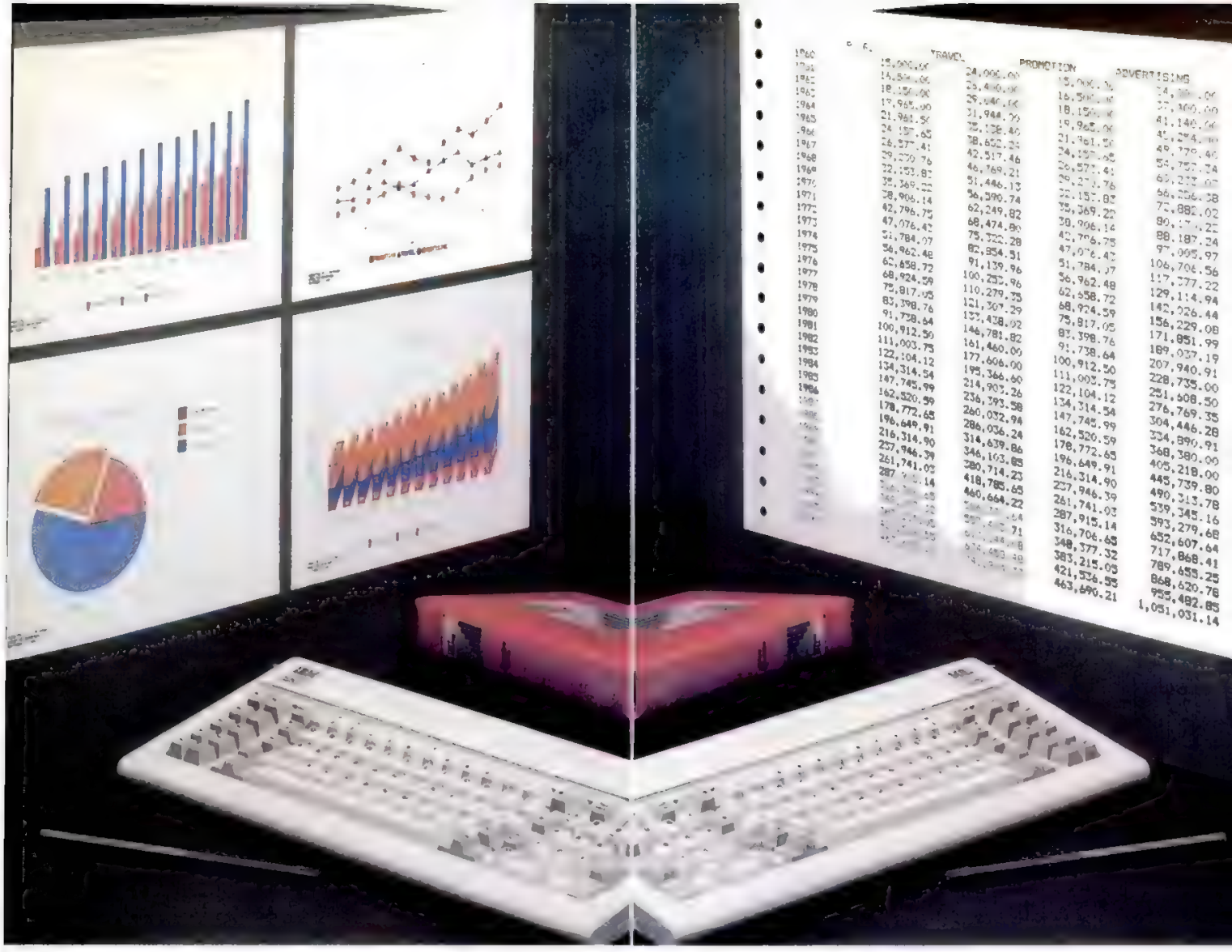


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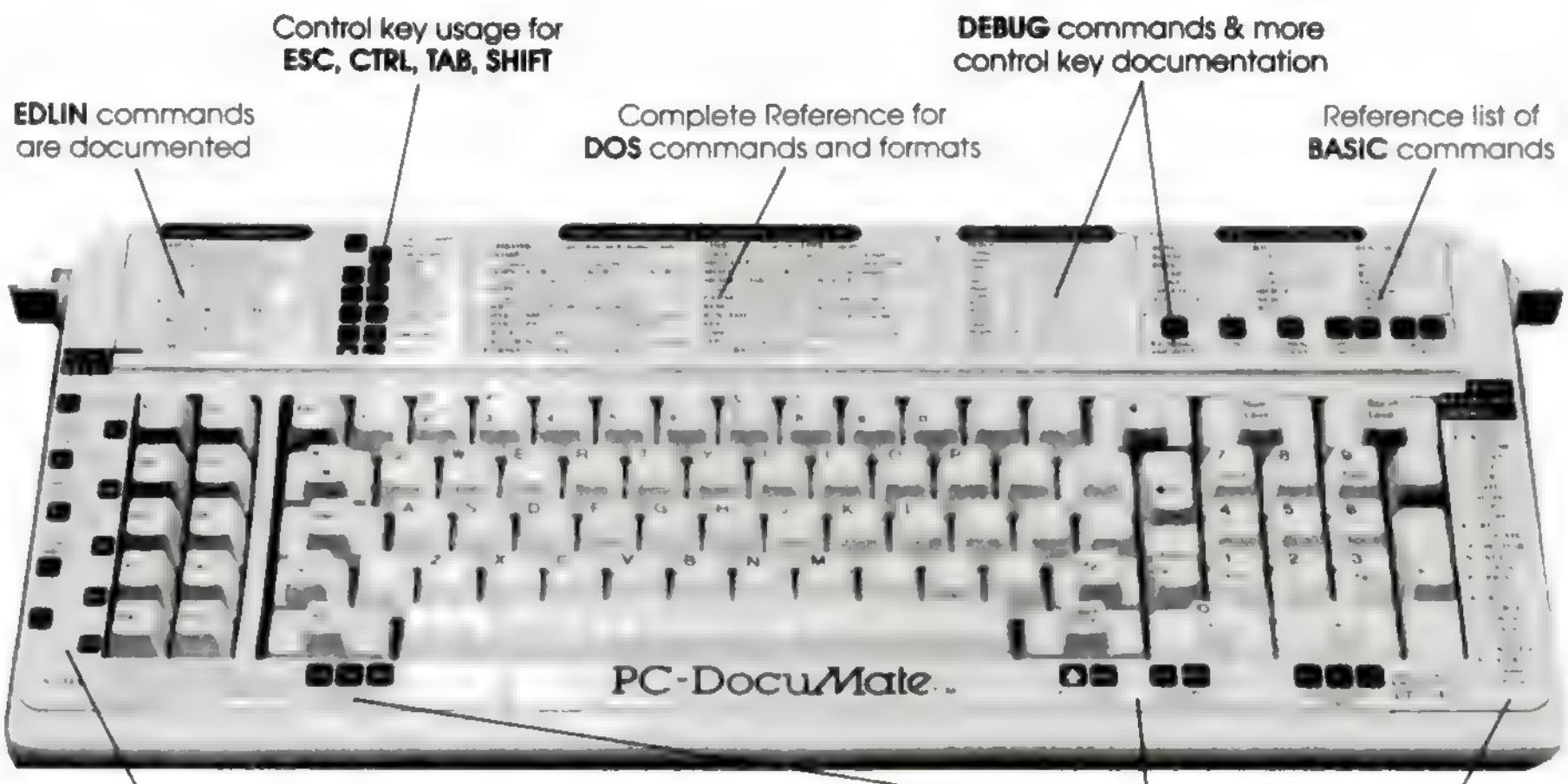
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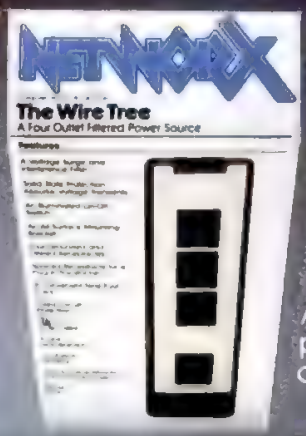
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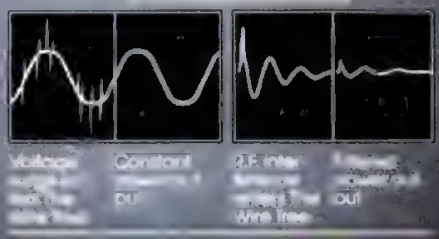
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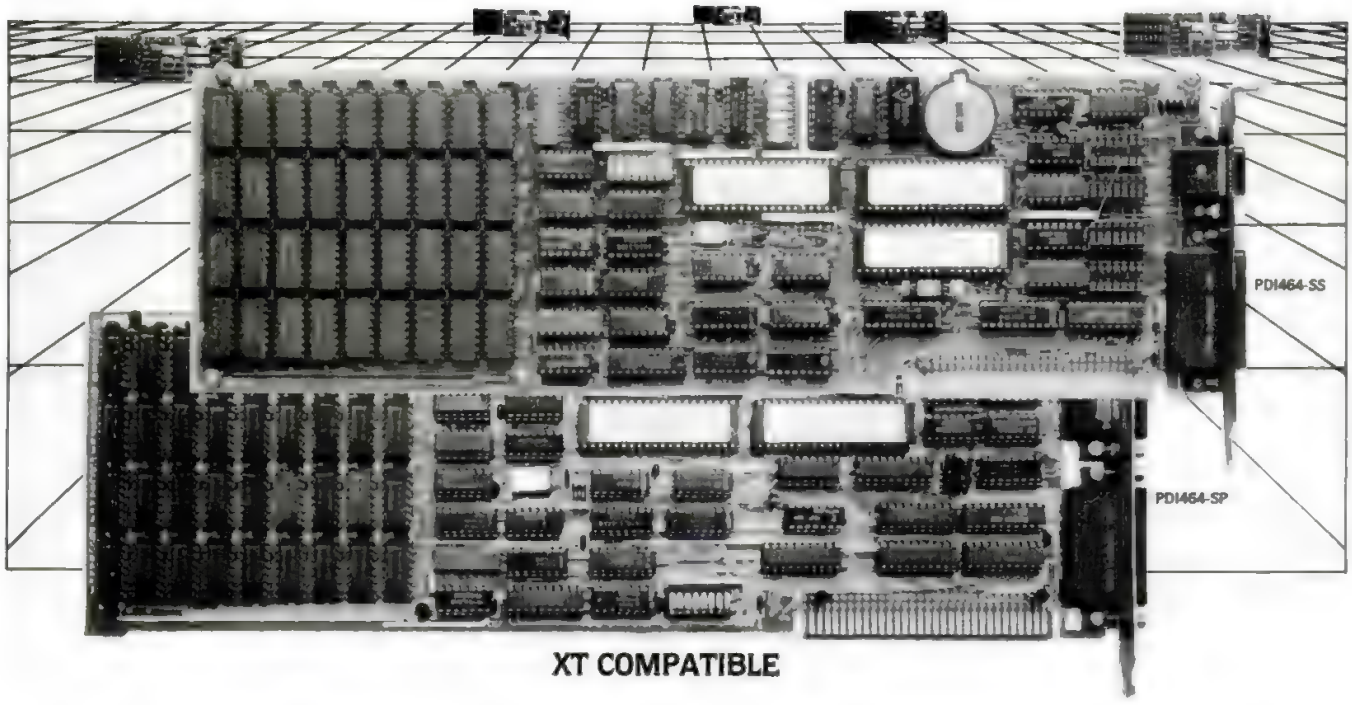
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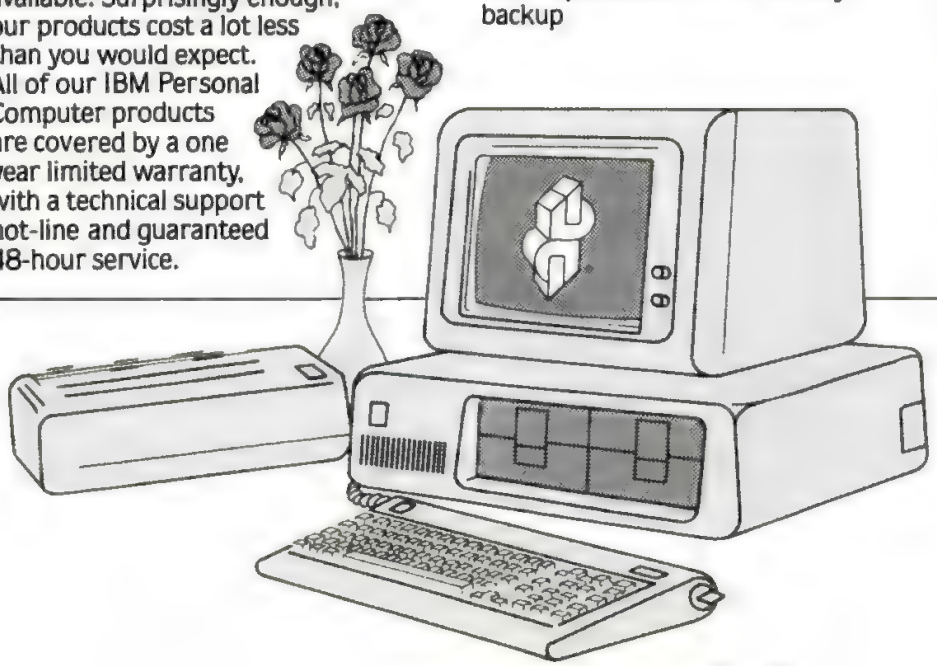
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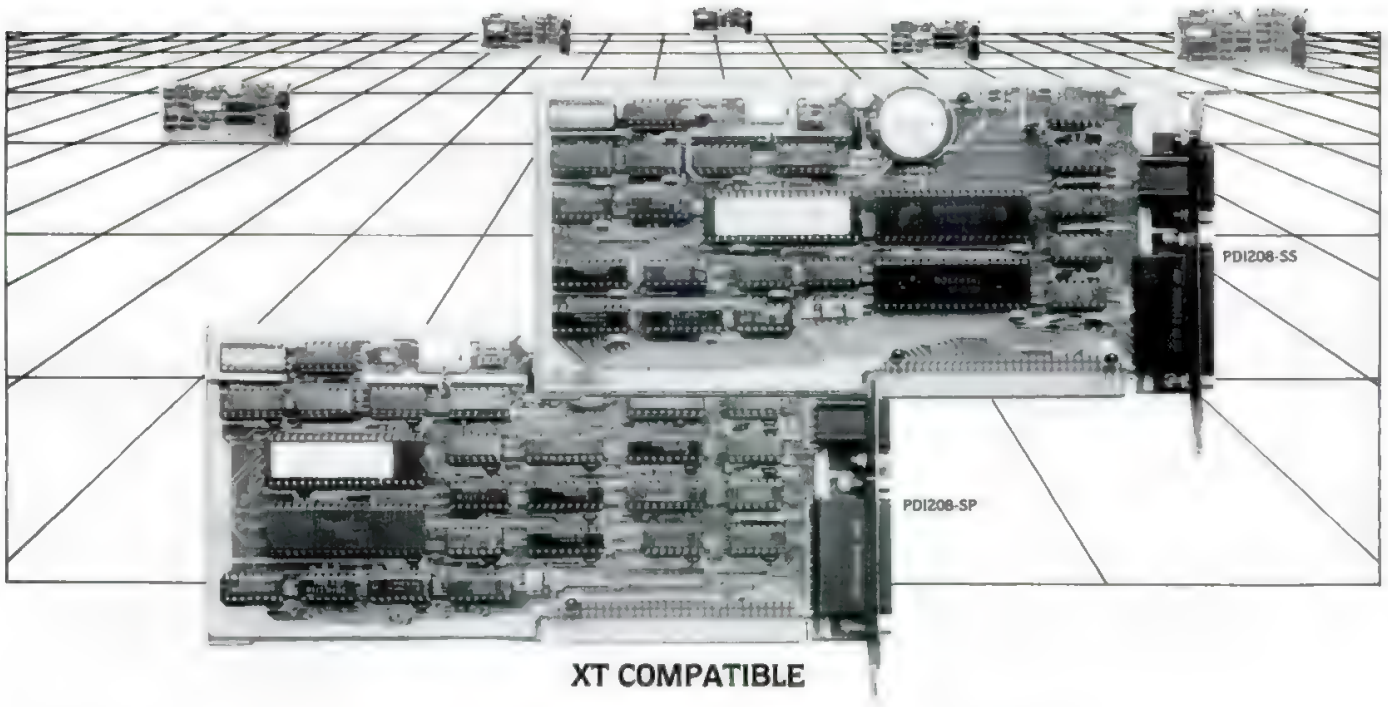
- Up to 256K of RAM, fully socketed, with parity generation/checking
- Highest quality ceramic RAM chips used throughout
- IBM-compatible serial channel with selectable address and 6-foot cable
- IBM-compatible parallel printer adaptor with selectable address
- Real Time Clock/Calendar with field-replaceable lithium battery backup
- p-Disk™ disk emulator for single/double-sided diskette emulation
- Print spoolers for parallel and serial channels with multiple copies
- Software for clock support, dynamic memory configuration, memory testing
- Only occupies one expansion slot
- Fully-illustrated installation and operation manual

PDI464-SS

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- Two IBM-compatible serial channels with selectable addresses, 6-foot cables



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XT COMPATIBLE

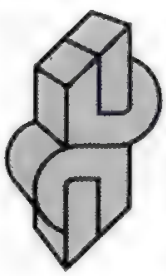
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- Real Time Clock/Calendar with field-replaceable lithium battery backup
- p-Disk™ disk emulator for single/double-sided diskette emulation
- Print spoolers for parallel and serial channels with multiple copies
- Software for clock support, dynamic memory configuration, memory testing
- Only occupies one expansion slot
- Fully-illustrated installation and operation manual

PDI208-SP

- IBM-compatible serial channel with selectable address and 6-foot cable
- IBM-compatible parallel printer adaptor with selectable address
- Real Time Clock/Calendar with field-replaceable lithium battery backup
- p-Disk™ disk emulator for single/double-sided diskette emulation
- Print spoolers for parallel and serial channels with multiple copies
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- Only occupies one expansion slot
- Fully-illustrated installation and operation manual

PDI208-SS

- Two IBM-compatible serial channels with selectable addresses, 6-foot cables
- Real Time Clock/Calendar with field-replaceable lithium battery backup
- p-Disk™ disk emulator for single/double-sided diskette emulation
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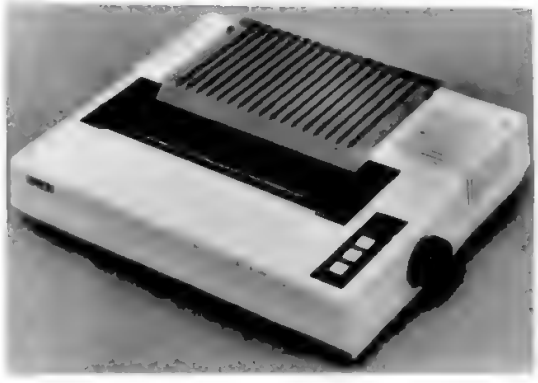
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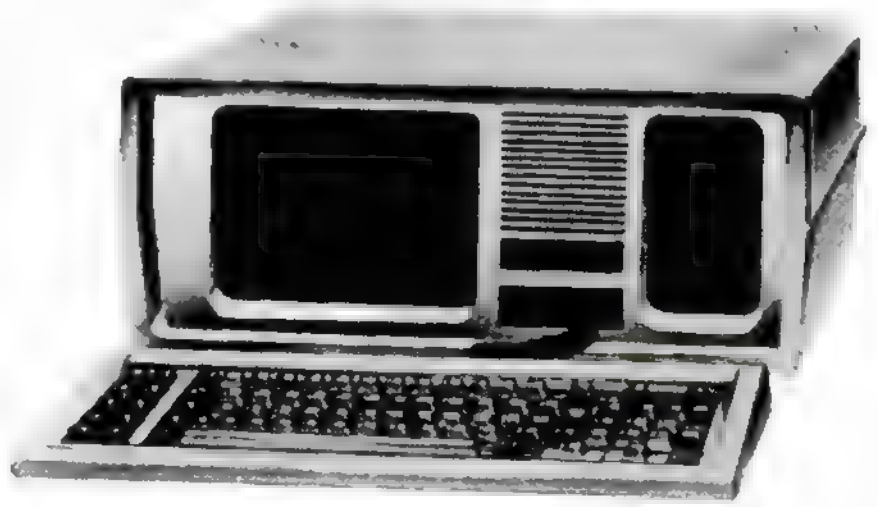
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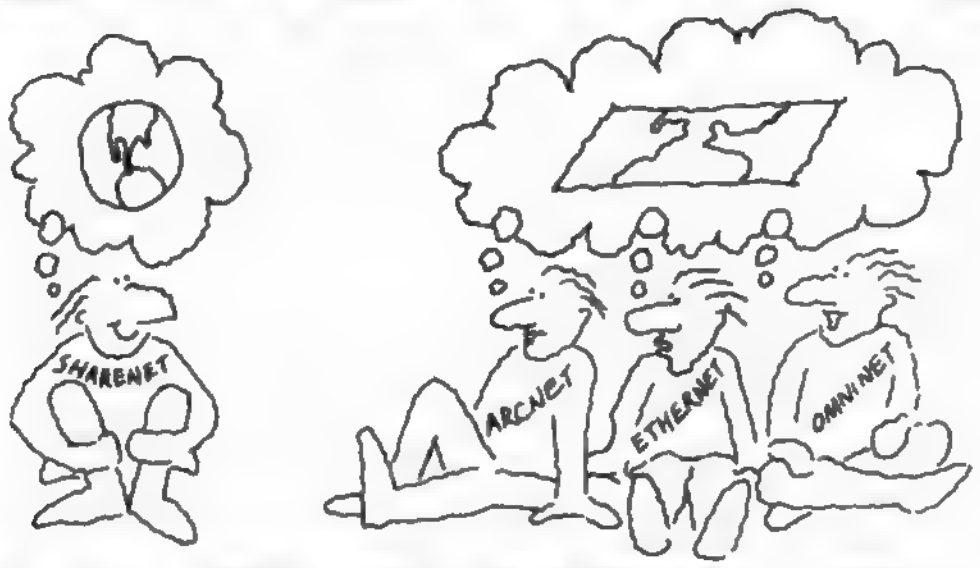
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*3Com Corp. in *March Systems & Software*, pg. 118
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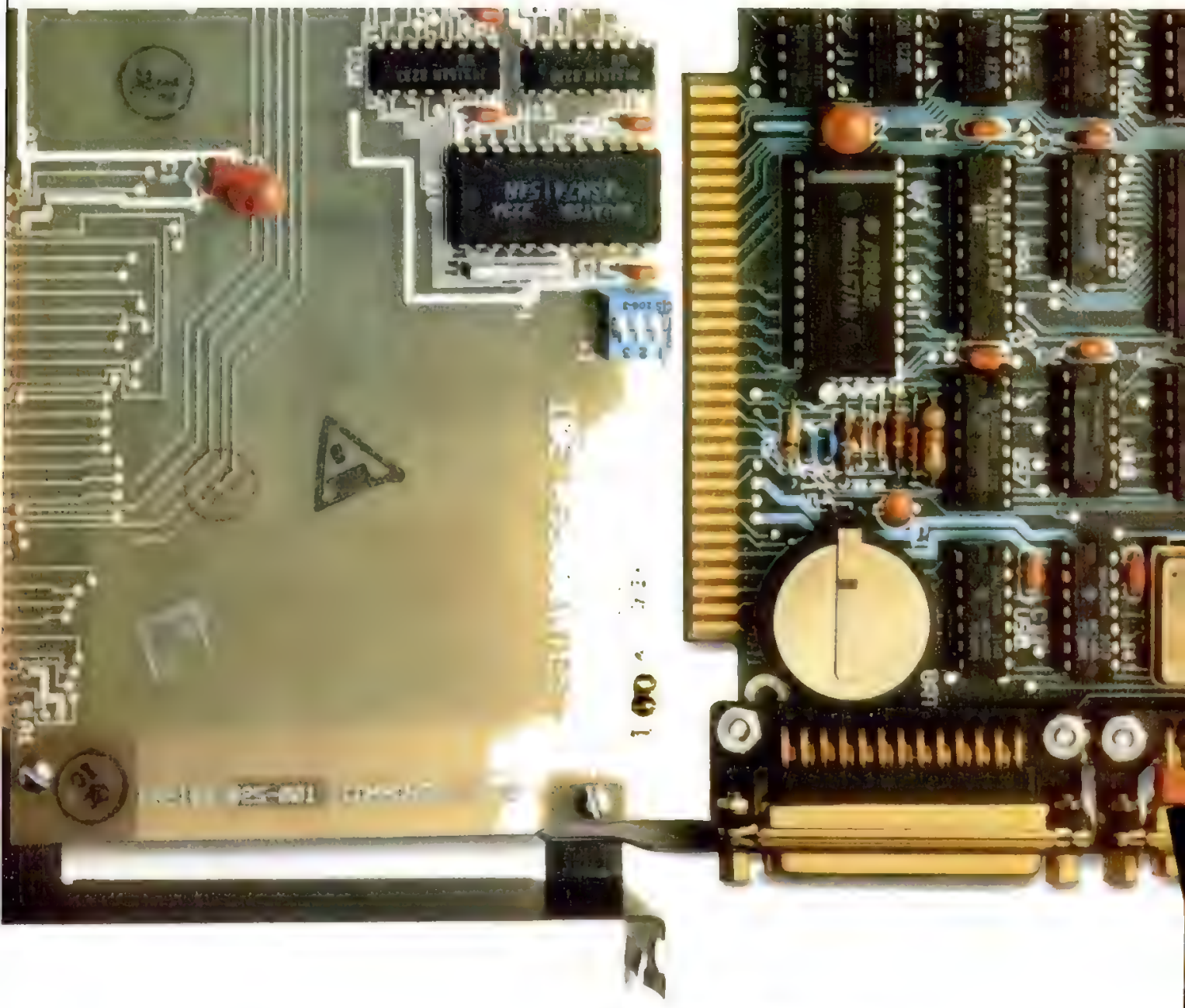
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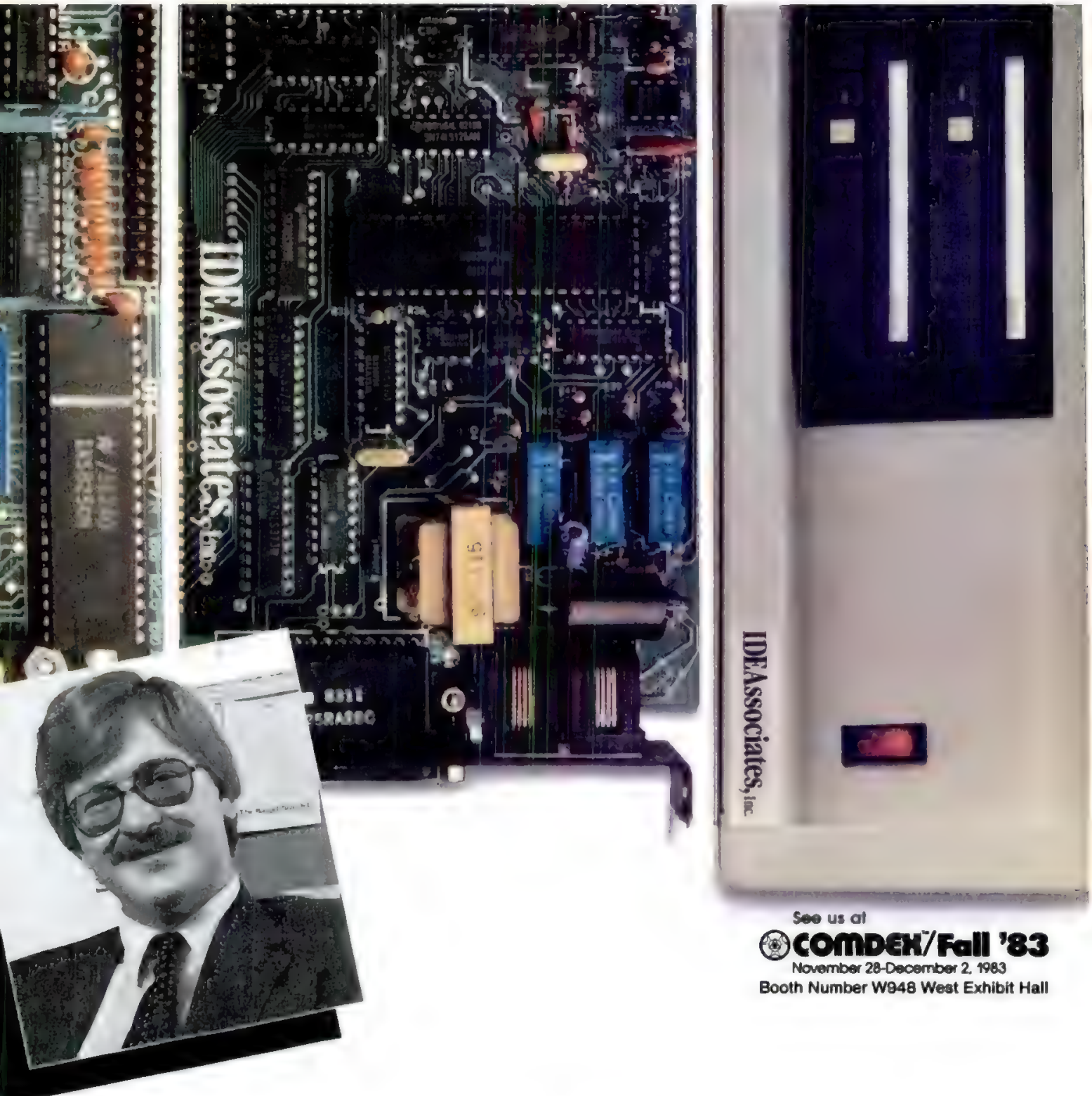
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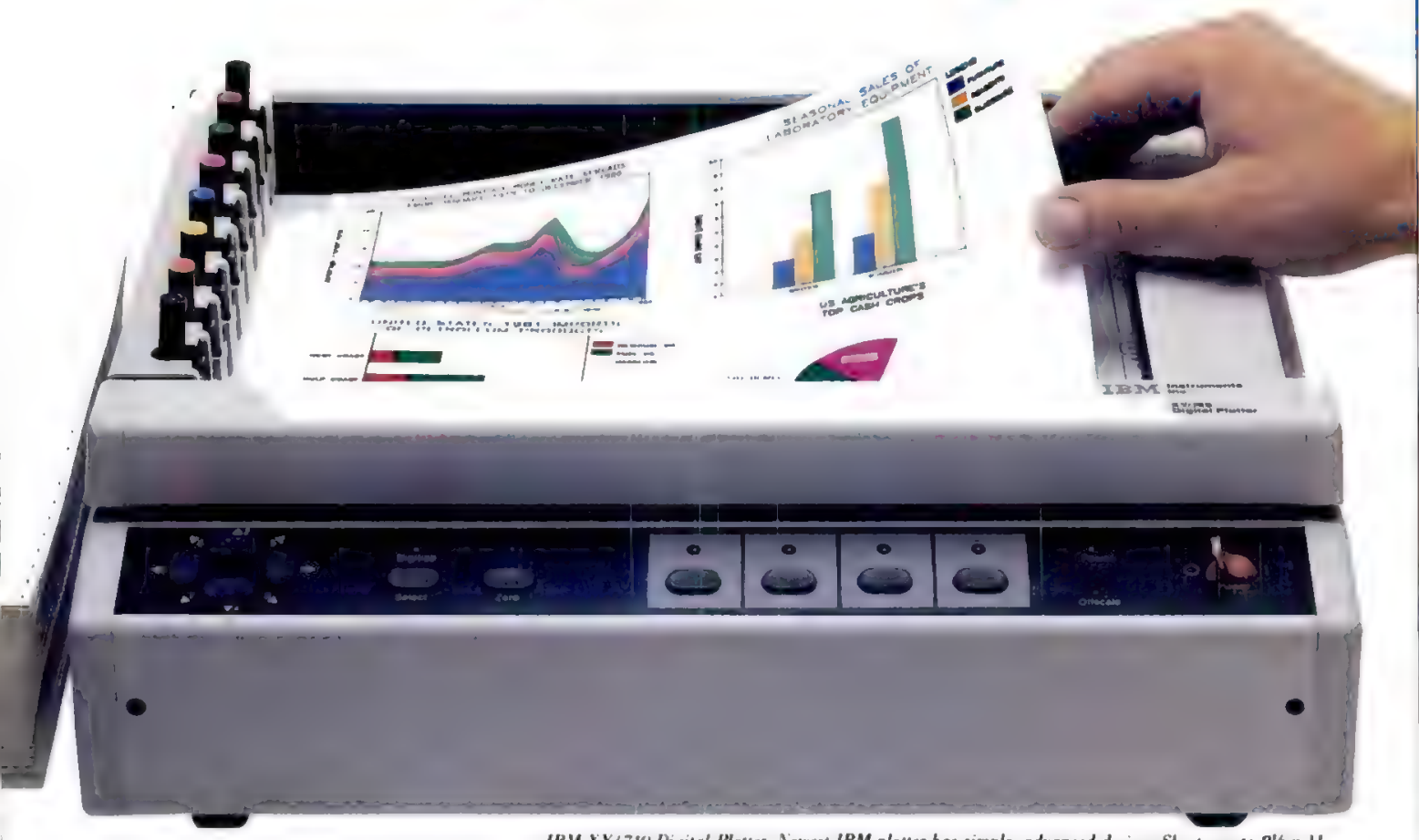
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Selecting a word processor for routine word-crunching tasks is a very personal thing—somewhat like selecting a pillow. One word processor (or pillow) isn't necessarily better than another. It's just different. You may choose one screen format over another, yet be hard pressed to explain your preference.

And, of course, if you have been using a particular word processor for a long time, you've already discovered all its bugs and established your own routines to work around them.

So if you are happy with the system you're working with now, why consider a change? Why even think about learning new formats and commands, strange codes, and keystrokes?

The answer has to do with the capabilities of the latest generation of word-working programs—capabilities that enable you to interface with other applications programs, such as dBase, to manipulate large numbers of files simultaneously or to create long, typographically-complex documents with ease.

Therefore, if your only word processing requirement is to generate the occasional bread-and-butter letter, you can probably continue to do quite well with what you've got. But if you are working with sophisticated documents or interfacing with other applications, it may be time to look at the latest developments in word processing. The payoffs in output, dollars, and time could be significant.

With these considerations in mind I reviewed two of the newest word-handling systems: *Datatext* from Florida-based Datatek Inc., and *ReadiWriter* from ReadiWare Systems of West Redding, Connecticut. We call them "word-handling" rather than "word processing" systems because of their modular internal structures.

Integrated Word Processors

Usually we think of a "word processor" as an integrated applications system that supports screen input, editing, and formatted printer output. Often, material is formatted right on the screen so that the user can see precisely what he's going to get from the printer. Most of these integrated systems carry printer-formatting information in file headers of the text files or manipulate the high-order bit of the last byte of a word in order to encode justification and spacing instructions.

The primary advantages of these integrated systems (*WordStar* is a good example) include ease of use and the ability it gives you to see what the finished document will look like while you are typing it.

The disadvantage of integrated systems is found in their hybrid natures. These systems are compromises in that they take the best features (but not all features) of a good editor and attach them to the best features (but not all features) of a good text-formatter.

A New Approach

An alternative approach—the one used by both *Datatext* and *ReadiWriter*—is to separate the editor and print formatter into entirely separate (but communicative) programs.

The proponents of this approach argue that memory can be devoted to all the bells and whistles of each program—the editor and the formatter—thus bringing full-feature capability to each.

Another advantage is that text can be written without concern for which printer will be used for hard copy. A text formatter capable of working with many different printers assumes responsibility for compatibility while the writer worries only about the content of the file.

We'll look at the *Datatext* package first because it offers both a full-screen editor and a formatter. *ReadiWriter* comes with a small line editor for touchup work, but the package's authors recommend that you employ a full-screen editor, such as the IBM Personal or Professional Editor, for initial document creation. *ReadiWriter*'s extraordinary power is found in its document-formatting capabilities.

The Datatext Editor

The *Datatext* full-screen text editor has been optimized to facilitate the handling of multiple files and to blunder-proof the user. Both of these functions rely on an edit buffer that automatically stores all deletions and inserts made during the editing process. This buffer can also be intentionally addressed for temporary storage of document segments.

The editor has two principal modes of operation—Insert and Edit. When in the Insert mode, *Datatext* functions like most word processing screen editors. The typist can set margins and tabs, call for justification or ragged right, and select automatic wraparound or manual carriage return operation. You can strike over mistakes on the current line.

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while displaying an 80-character window at any position. Decimal tabbing is implemented and so is hyphenation help.

Another feature you will like is the automatic insertion of "new paragraph" and "add line" tags (dot commands) used by the formatter. The ability to opt for automatic insertion of these commands in routine document production can be a big timesaver

The Edit mode, accessed by two keystrokes, is where *Datatext* really shines, particularly in the matter of saving you from yourself. All of the Edit submodes such as Delete, Insert, Copy, Replace, Move, and Mark are accessed by a single keystroke. We'll use the editor's Delete submode as an example.

Let's assume that you have typed your document and have invoked the Edit mode. The document appears on screen just as you type it. The top line of the display contains a short Help menu. To delete a word, phrase, or line, you position the cursor at the beginning of the string to be deleted (using the keypad arrow keys). Next you tap the D key to invoke the Delete submode. Now you either space or tab over the characters to be deleted. You can also opt to tell the system how many characters are to be deleted and then tap the space or forward arrow once to generate the deletion.

You can backspace after the deletion to return the deleted characters to the screen. When you are satisfied with the deletion you tap a function key marked "Accept." The deletion is accepted and the copy is closed up.

Even after this Accept action, all is not lost if the deletion is in error. The system automatically writes the deleted material to the edit buffer after each Accept. If you wish to reinstate the deleted material, you need only position the cursor and copy the edit buffer back into the text using the Copy submode.

You can also use the edit buffer to rearrange text by stacking various sections and then recalling the reconstructed text block. Material can be written to or brought into the current text using the edit buffer and similar editing techniques.

The Edit mode is also used to move lines horizontally. A line can be centered or left- or right-justified with two keystrokes. Lines immediately following the newly-positioned line can be given the same justification merely by moving the down arrow to that line. Therefore if you have, say, five lines to center, you simply center the first line, then hit the down arrow four times.

A margin feature (familiar to users of *WordStar* and *EasyWriter*) enables text paragraphs to be reformed whenever inserts and deletions have upset the preset style. I am not suggesting that the *Datatext* editor provides faster on-screen editing than the familiar PC word processors; it doesn't. In fact, some users may find that separate edit/copy input (insert) modes actually slow them down during an edit session. I suspect that experienced *Datatext* users will be able to edit a document

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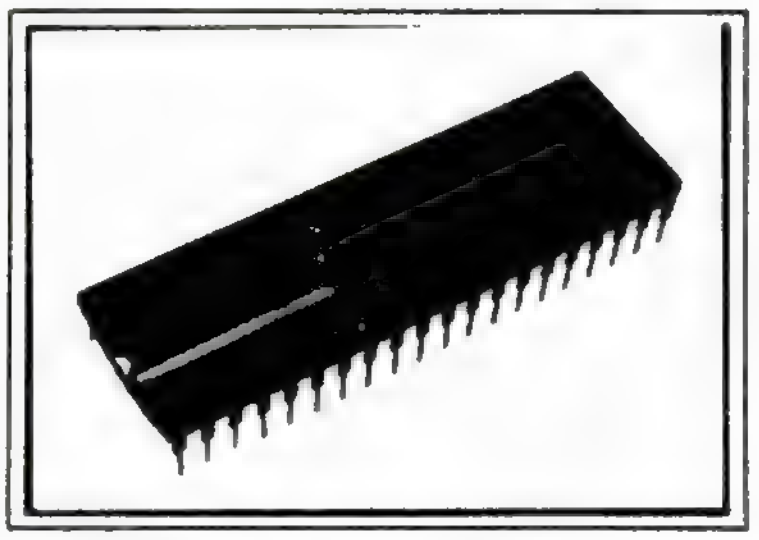
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in about the same time as users of any other system. The real advantage comes in the automatic deletion backups and recall facility.

Datatext author Bob Cymbalski informs me that his goal in developing the editor was to present the most sophisticated features of modern text editors with a minimum of command complexity. In my opinion, he has met this goal fairly well. The one-line, on-screen prompt serves to coach the user in most regular routines, and for any command, in-depth, on-line help is available without leaving the current setup. Moving in and out of the various modes and submodes requires only two or three keystrokes at most and often only one.

Cymbalski is reluctant to use the admittedly overworked term "user-friendly" to describe the disposition of his editor. "After all," he says, "this is a sophisticated program and the first-time user must ultimately grasp some very sophisticated editing concepts." He does point, however, to relatively painless initial training. He claims that a secretary inexperienced in word processing concepts can be trained in 2 working days.

Ease of training is more a consequence of the extraordinarily well-written manual rather than attempts at establishing user-friendliness within the program.

The tutorial assumes the user knows nothing about computers, DOS, or word processing concepts; therefore the *Datatext* learner needs only that document and a working disk.

The most recent version of *Datatext* includes an interface that reads straight *dBASE II* files without the need for special formatting.

Screen editing is one half of word processing; text formatting is the other. Typically, a text formatter handles plain-vanilla ASCII text files that contain the text to be printed as well as text commands that tell the formatter what you want the printer to do with various blocks of copy.

A text formatter's capabilities, therefore, are determined by how much it can do to help you format and print a complex document, and of course, by how flexible it is—how many different types of printers it can drive and how successful it is at taking advantage of the various features of those printers.

As mentioned earlier, I looked at two text formatters for this review: the *Datatext* Word Processor and ReadiWare's *ReadiWriter* Document Formatter. Figure 1 compares some of their common features.

Comparison of Datatext and ReadiWriter Text-Formatting Features

Feature	Datatext Word Processor	ReadiWriter Document Formatter
Printers Supported	Qume, Diablo, Diablo 1620, Centronics 737, NEC, AJ832, Starwriter, Xerox 630 Dataproducts	All letter quality or dot matrix
User-defined printer	NO	YES
Accessories supported	Tray loaders	NONE
Proportional spacing	Supported for Qume, Diablo Centronics	Supported for all printers with proportional capability.
Tag compatibility with other formatters	None	IBM Script and GML
Index generation	YES	YES
Contents table generation	NO	YES
Auto footnoting	YES	YES
Auto long-quote formatting	NO	YES
Auto list-nesting	NO	YES

Figure 1: Both Datatext and ReadiWriter include all the common text-formatting features found in integrated word processing systems, such as WordStar, in addition to those special features outlined above.

Let's look now at some of the general attributes of text formatters. Consider for a moment the following lines from the salutation of a business letter:

January 27, 1983

Mr. John B. Doe
999 Treetop Lane
Anywhere, USA 22222

Dear Mr. Doe:

Using a traditional word processor, you simply type the lines as they appear above, making sure that everything is flush left, and then you push the Print button to get hard copy.

Now take a look at the same lines set up for digestion by a text formatter (in this case, the *Datatext* formatter):

```
.add 5
.fill on
.jus on
.mdy
.add 3
Mr. John B. Doe
.newp
999 Treetop Lane
.newp
Anywhere, USA 22222
.add 1
Dear Mr. Doe:
```

In the first example, you merely type the letter on the screen the way you want it to print out and then push a button. In the second case, you would have to add textual commands (called tags or dot-commands) to tell the text-formatting program exactly what you wanted the printer to do. Granted, this can mean extra typing for the typical one- or two-page business letter.

But consider, on the other hand, a large document—a software manual, perhaps, or a full-blown novel—that needs headers and footers on each page, page numbers, footnotes, a table of contents, typeface changes within a page, various indents and list schemes and dozens of complex, linked files.

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style and attempt to do all this on-screen formatting you would find that you were paying more attention to the formatting task than to writing your document.

Here the document formatter really shines. The tags enable you to establish a "style" for the document at the outset while the computer generates style consistency for the rest of the document.

The really sophisticated formatters such as *ReadiWriter* (and to a large extent, *Datatext*) can keep track of key words and automatically generate chapter titles, subtitles, indexes, and tables of contents. The formatter also takes care of vertical alignment in lists, decimal tabbing, changing type fonts, and the merging of variables from other files.

ReadiWriter

For a closer look at a document formatter, let's examine *ReadiWriter* features. (Many of these are similar to features offered by *Datatext*.)

Bruce Marshall, *ReadiWriter*'s author, told me that he developed the system to provide a microcomputer text formatter with the same command structure and functions as mainframe formatters—particularly IBM's GML and Script.

ReadiWriter supports proportional spacing on any printer capable of handling it (wheel, ball, or dot-matrix) and enables you to configure the program to access any special features an off-brand printer can handle. The usual print specifications—underlining, boldface, superscripts and subscripts—are implemented for virtually all printers having those capabilities.

Comparatively Speaking

ReadiWriter's tags begin with colons instead of the dots used by *Datatext*. The data entry discussed above would look like this if prepared for *ReadiWriter*:

```
:set justify on
:skip 5
January 27, 1983
:nl.Mr. John B. Doe
:nl.999 Treetop Lane
:nl.Anywhere, USA 22222
:skip
Dear Mr. Doe:
```

As you can see, the style and format of printing commands differ slightly between *Datatext* and *ReadiWriter*, but the general command theory is similar (.nl. means start a new line).

I said earlier that *ReadiWriter* was designed to be compatible with IBM's mainframe formatter, Script. In fact, *ReadiWriter* supports the most commonly-used Script commands even though their syntax differs from that of *ReadiWriter*. For example, the Script command for "skip five lines" is .sk 5 while the *ReadiWriter* command for the same function is :skip 5. A document prepared for Script will run under *ReadiWriter* with the addition of a single leading colon-command—:compat script. Once *ReadiWriter* sees this command, it assumes that all commands to follow will be in Script format until it sees a :ecompat.

This also means that files created for ProSoft's *NewScript*, a TRS-80-based Script emulator, can be printed using *ReadiWriter* and a PC. (Obviously files created on an IBM mainframe or a TRS-80 must be downloaded to the PC first so that the DOS file structure is correct.)

Both *ReadiWriter* and the *Datatext* word processors have extensive file-handling capabilities. Entire files can be embedded in a document and variables can be pulled from the file for insertion in a document. These features are especially helpful in preparing mailings with embedded personalization or in drawing up building contracts by selecting clauses from a "clause library."

One of *ReadiWriter*'s unique features is the ability to keep track of chapters, subchapters, numbered paragraphs, and nested lists, all automatically. This is especially helpful if you discover that you have forgotten something in a nested list.

If you tried to correct this with a traditional word processor, you would have to make a dozen other changes to accommodate the additions. Since *ReadiWriter* takes care of all numbering at all nested levels, the writer has only to make a single revision. The text formatter takes care of everything else.

In this article I have only skimmed some of the more specialized features of standalone editors and standalone document formatters. Necessarily so, for the documentation for *Datatext* and *ReadiWriter* each runs several hundred pages.

However, both Datatek and ReadiWare have inexpensive trial packages that enable you to try out the word processors on self-destruct disks. The trial package from ReadiWare costs $30; the package from Datatek costs $75.

I strongly recommend that you look at trial packages before selecting any text formatter. Not only will your document formatter have to include features unique to your text requirements, but it will have to work with your system.

In any event, these standalone systems offer a degree of sophistication for producing complex documents that most combined word processing systems simply cannot match.

If you are struggling with large, complex documents and are pushing the limits of your current system, it might be time to take a look at the standalone editors and formatters. */PC*



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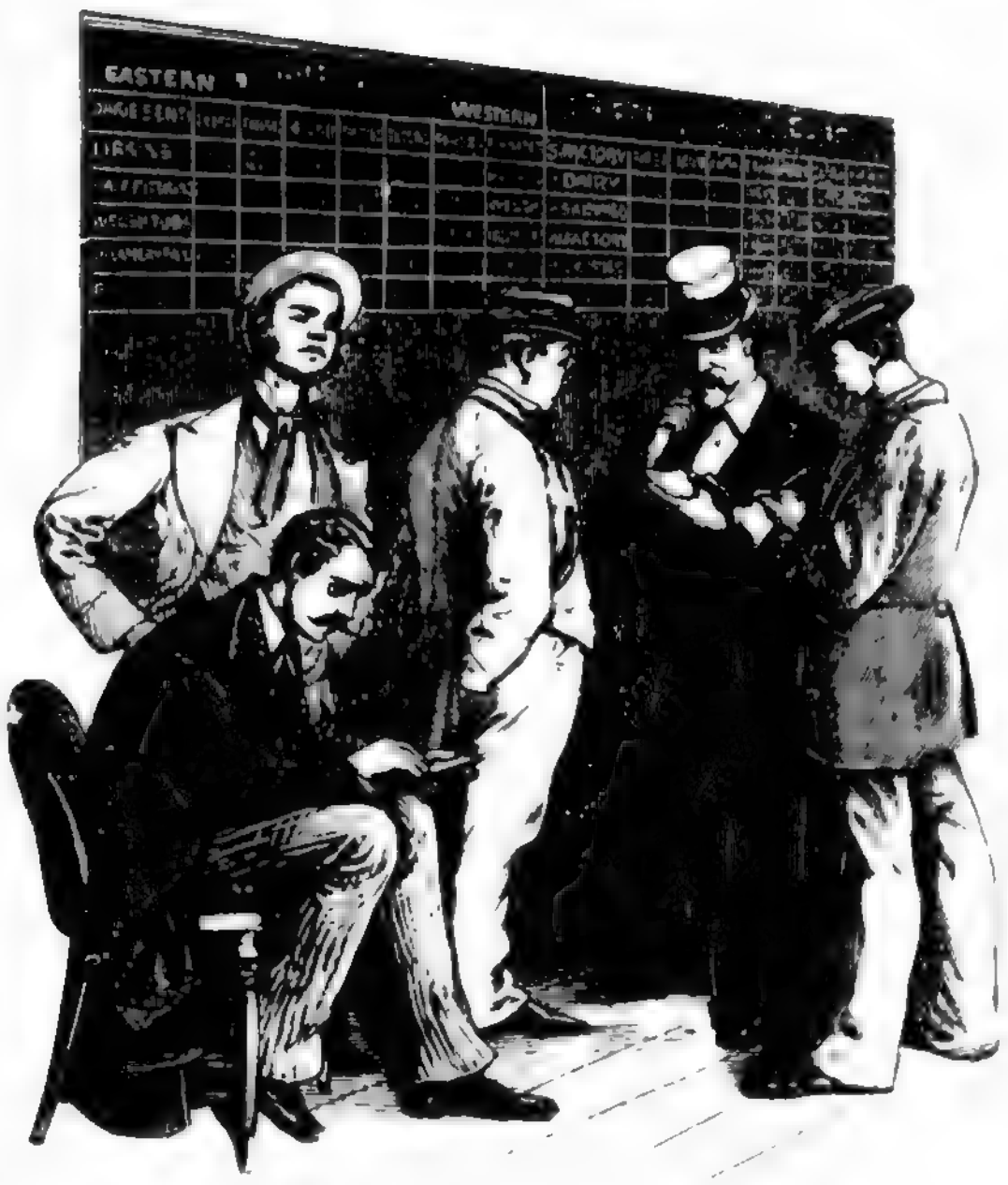
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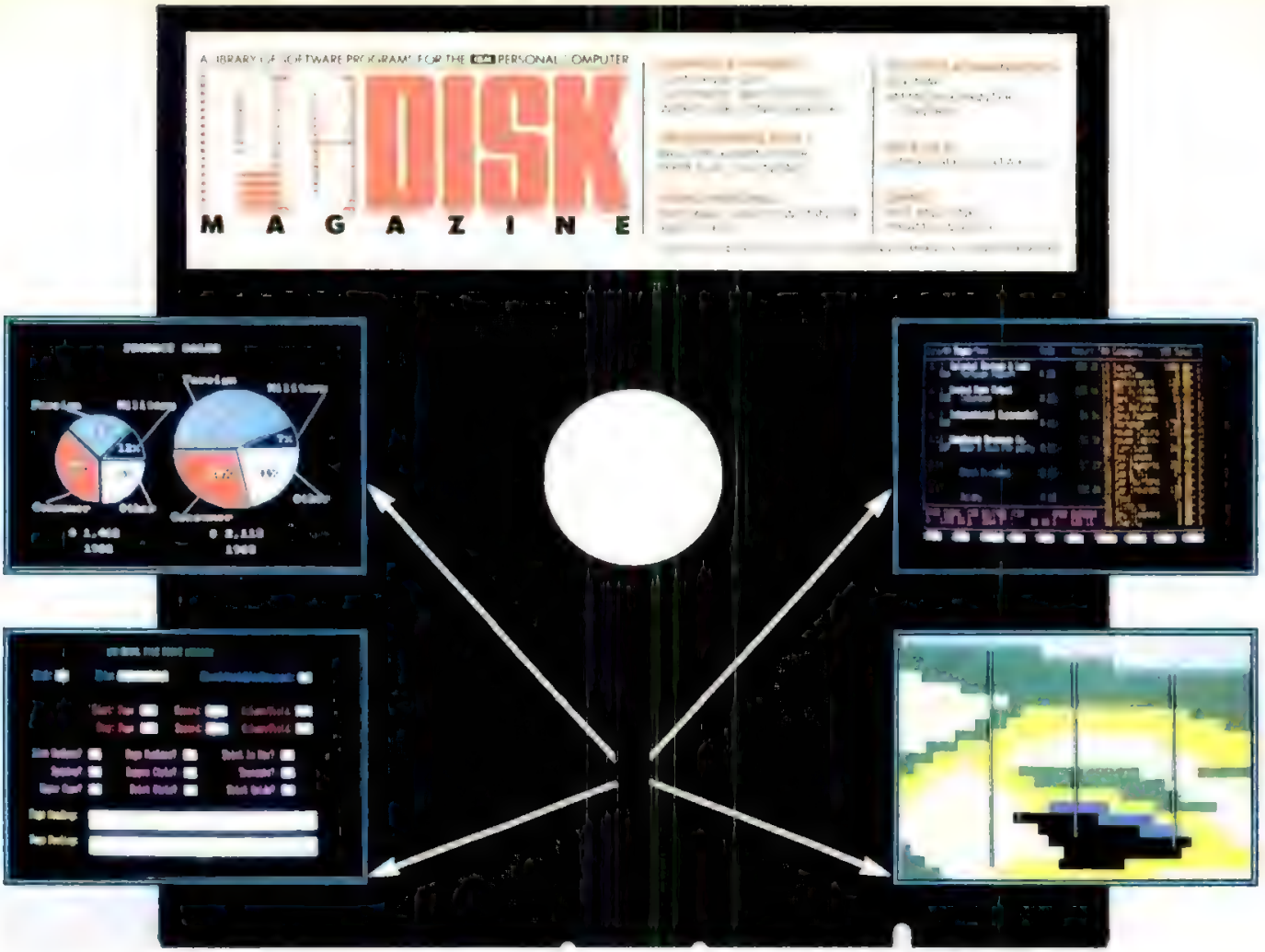
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Without software, a computer can't do anything. And vice versa. You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

The simpler the better.

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

Simply see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask your friends who have them.

Or look at all the sales literature you can get your hands on.

But as helpful as that can be, there's no substitute for a live demonstration.

When you do go shopping, we recommend you take a look at the PFS® Family of Software.

Designed the way we think a software family should be: simple, straightforward and powerful.



Currently there are four software packages in the family: PFS:WRITE, PFS:FILE, PFS:REPORT and PFS: GRAPH, with more on the way. Here's a little more about each of them.

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PFS:WRITE is ideal for people who want to make their writing time more productive. It displays what you write on your computer screen so you can make revisions as you compose.

With WRITE, you can correct misspellings or substitute one portion of text for another, with just a few keystrokes.

And when you're through revising, WRITE shows you "on-screen" just how your document will look when it's printed. So there are no surprises afterwards.

WRITE also works with most popular software programs, including the PFS Family of Software.

This feature allows you to add names and addresses from mailing lists to generate form letters. Or combine columns of numbers or graphs with your text.

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With FILE, you arrange your information on a "form" you design yourself. And when you need to track something down, FILE sorts through your records electronically. It lets you retrieve information in a variety of ways so you can be as selective as you want.

PFS:REPORT. The simplest way to sum it all up.

REPORT is a powerful analysis tool that works with FILE.

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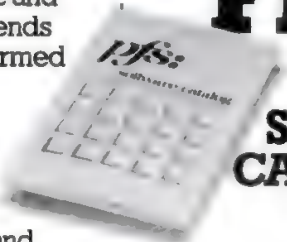
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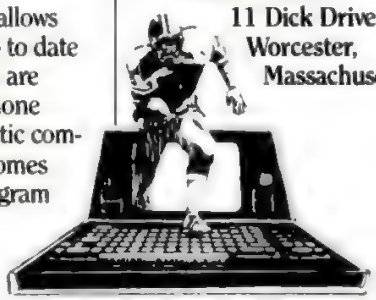
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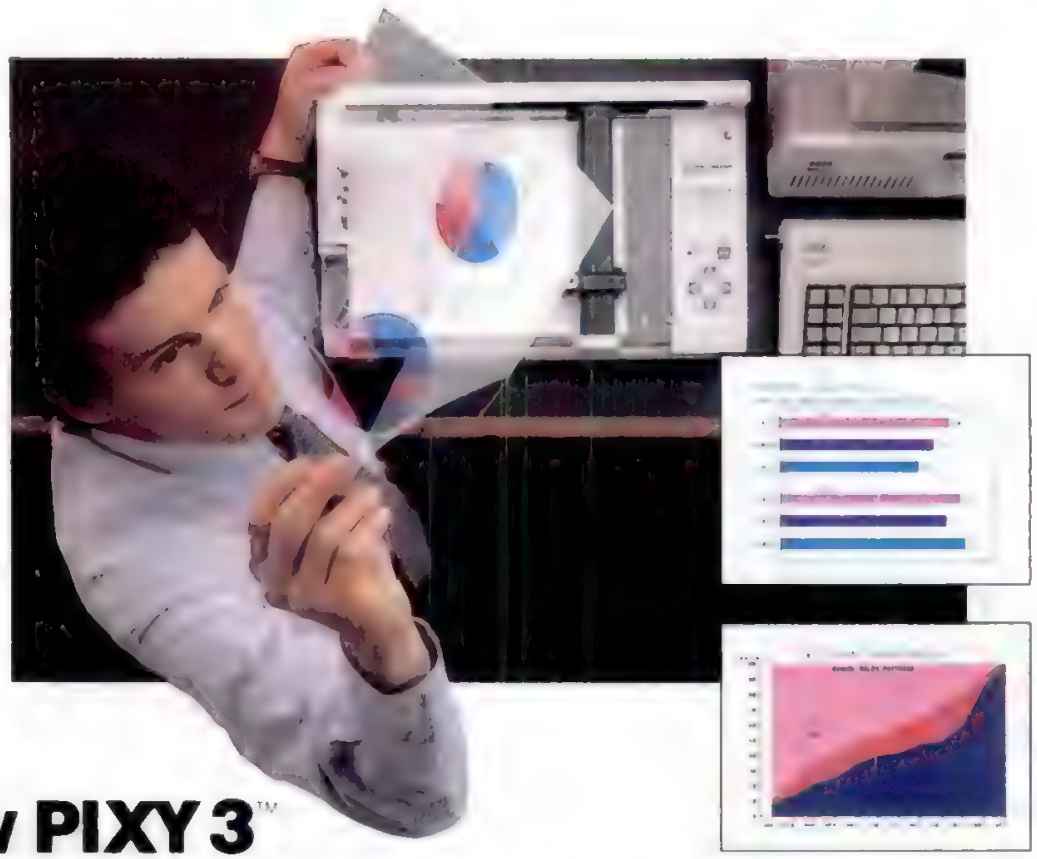
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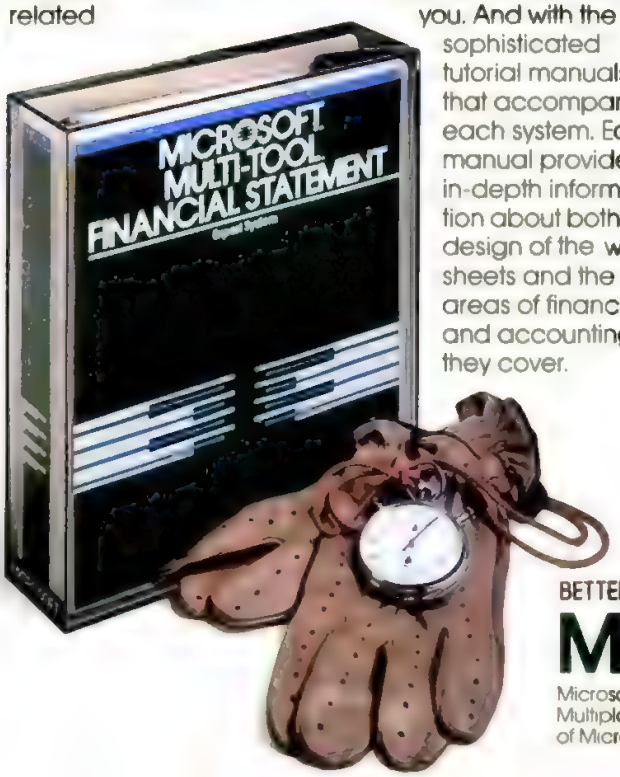
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In the old days, before the advent of the PC, programmers wanting word processors chose either *WordStar* or *Magic Wand*. Although *Magic Wand* no longer has a strong following, in those days it had its die-hard fans. They might rediscover some of the magic in a new program called *Panlantir*, which was written by Magic Wand's creator, Mike Griffin.

The original *Magic Wand* underwent a transformation when IBM updated it and renamed it *Peachtext*. This means that Mike Griffin, word-processor-programmer-extraordinaire, is now the new kid on the block, competing not only against *WordStar* (again), but also against the latest incarnation of his own earlier programming effort.

Word processors are complicated programs. Users demand many features: flexible formatting, file-handling, mail merging, text buffering, file merging, block moving and replacing, fancy finding and replacing, and so on. There's also a demand for printer support, an area slighted by many word processors.

Palantir excells in every area. It's not cheap, however. List price is $450, although discounts can be found. The price includes both *Palantir* and *Mailout*, an integrated mail-merge package with extensive mass-mailing capabilities.

Overview

You wouldn't plunk down $450 unless a word processor has lots of features, and *Palantir* does. Figure 1 lists some of *Palantir*'s text options.

But features alone aren't enough. Features won't be used if they're hard to access, difficult to remember, or if they perform unpredictably. *Palantir* sur-

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Figure 1: A quick indication of the range of text options available with Palantir.

Palantir Text Options/Attributes

Boldface	Named blocks
Underlining	Merge file(s)
Double-underlining	Decimal tab
Strike-through	Discretionary hyphens
Ribbon shift	'Unsplittable' hyphens
Extended character sets	'Hard' space
Alternate type fonts	Overprinting
Display/print format codes	Superscripts
Center text	Subscripts
Flush right	Headings (one or more lines)
Split text	Internal 'notes'
Insert text	Multi-line footings
Move text (1 character to block)	Flexible page numbering
Copy text (as above)	Paragraph 'Widow' control

Figure 2: Palantir's Define menu sets page length, margins, font, offset, and first page number. The options continue on the Format and Print menus.

PALANTIR Word Processor 1.1
Document Information

Option	Explanation	Current
RESUME	Return to Main Menu	
SIZE OF PAGE	Page size at 6 LPI (0 for no paging)	66
TOP MARGIN	Lines to skip at the top of the page	3
BOTTOM MARGIN	Lines to skip at the bottom of the page	6
PRINT FONT	Name of a special printer font	
OFFSET	Columns to skip before printing	8
CHANGE FORMS	Pause to change forms at each page?	No
FIRST PAGE	First page number for the document	1

Move the cursor to the line you wish to change and press Return. Select Resume when finished, or press Cancel to ignore changes.

mounts these potential problems with a three-pronged approach: function keys, informative menus, and a powerful design concept.

The design concept is based on the Esc and Return keys. Pressing Esc always takes you up, out, or back. Return works just the opposite way; it selects or drives you forward in the program.

The highest level of "up" is the main menu. The menu displays the name and size of the current file, cursor location on edit screen, and disk space remaining (in percent and by kilobyte). Along the top of the screen are the words: EDIT, READ, SAVE, BACKUP, FILE, PRINT, TYPE, DEFINE, HELP.

When Edit is highlighted, pressing Return selects EDIT and takes you to the EDIT screen. Press Esc and you're back to the main menu. Press Return again, and your cursor is nestled in the EDIT screen, just where you left it.

Other selections are made by pressing the first letter of your choice (d for DEFINE) or by browsing; that is, using the cursor keys to highlight a selection, then pressing Return. The same approach is used by 1-2-3 and by Visicorp's much anticipated but yet to be evaluated, *VisiOn*.

A typical example is the DEFINE menu (see Figure 2). As you can see, the options are clearly explained. Each option has a default setting for common document handling, but each can be quickly changed. (If you like, the new defaults can be saved on a disk, then loaded when beginning *Palantir*.) For more explanation, select HELP from the main menu for a table of contents menu that allows you to choose from 25 screens detailing everything from moving the cursor to naming files.

The Esc/Return combination makes it impossible to get lost or stuck in *Palantir*. Esc always gets you out of trouble, whether it's returning to where you started, or undoing a command in progress. If you see an error during printing, press Esc and printing stops; If you change your mind during a lengthy SEARCH and REPLACE operation, press Esc and the operation stops. When finished for the day, press Esc from the main menu and exit gracefully. (Don't worry, *Palantir* won't allow accidental exits to occur.)

Good Rules

Before we process words, let's look at the EDIT screen. The top line displays the cursor position, scrolling arrow, typing mode (Insert or Change), commands in effect (set in boldface), and necessary prompts. A Print Ruler on the second line displays, in inverse video, tab settings and the justification chosen. Transient messages—Reformat after Deleting the Ruler? (Y/N), for instance—sometimes appear at the bottom of the screen.

PALANTIR won't allow accidental exits to occur.

Delete the Print Ruler! Well, you can't delete the first print ruler, although you can change it. You may, however, insert additional rulers wherever you'd like, which is an extremely powerful feature. Inserting a print ruler lets you change text parameters section by section, or even line by line. The parameters available for change are listed in Figure 3.

In other words, one section of your text might have pica font, double spacing, standard margins, and normal ragged right edges. The next section might be fully justified, single spaced, indented, and use a condensed type font. And the next section might revert to the original settings. This is one trick not in the *WordStar*'s bag.

You can add an unlimited number of rulers. Where needed, the options are explained and chosen from a Format menu.

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Figure 3: Text formats may be changed anywhere within the document by inserting format rulers and selecting new options from the Format menu. All default formats are easily customized.

Palantir format options
Left/right margins
Justification type:
- Normal (ragged right)
- Semi-justified
- Fully justified
- Manual (program editing)

Proportional spacing
Characters per inch (type size)
Lines per inch
Spacing (1, 1½, double, triple, etc.)
Print Font
Intensity (reprints line to 9 times)
Tabs
Double-strike or shadow print boldface
Half or quarter line sub/superscript
Strike-through character set

Figure 4: F3 sets scroll direction. SET and CLEAR provide access to an array of operations. F4, F6, F8, and F10 primarily scroll text. LEXICON inserts user-defined phrases from a lexicon library.

Palantir function key assignments

F1 SET	F2 CLEAR
F3 DIRECTION	F4 LINE
F5 FIND	F6 SCREEN
F7 FORMAT	F8 PAGE
F9 LEXICON	F10 DOCUMENT

Function Keys

The third part to *Palantir*'s three-pronged approach is function keys F1 through F10. Each key has been given an assignment (see Figure 4). The most important keys are Set and Clear, because they provide access to an assortment of operations. All text attributes, and most operations, are Set, then Cleared. To underline, for example, place the cursor under the first character to be underlined, press F1 for Set, press the underline character (on the hyphen key), move the cursor to where underlining ends, then press F2 for Clear, and then the underline character.

It may sound harder than it is. Unlike *WordStar*'s control key combinations, only one key at a time is pressed. And virtually everything works from the same principle. For headers or footers press, Set, then h; or Set, then f. For page numbers, Set, then the space symbol (#). To force a hard page break, press Set, then Page.

To remove part of the text, press Set, then Del. A message appears: "Move cursor to outline text." Press Return (or Esc) when ready. Now move the cursor, using either the cursor keys or the scrolling keys, F4 through F8. As you outline the text, the characters (or lines, or screens) appear in inverse video. Now press Return, the section is deleted, and the paragraph is reformatted, if necessary.

Blocks may also be outlined up to any character merely by pressing that character's key after the "outline . . ." message appears. To set a block that includes everything up to the next period, just hit the period (.) key. *Voilà!*

It's easy to see what you've outlined, and nothing actually happens until you press Return, or until you press Esc to "jump out" of the deletion process.

Block moves and copies are handled the same way. Press Set, then b (for block). The message, "Move cursor to outline. . .," appears again. Outline the text, as before, then press Return. Another message appears: "Move or Copy M/C?" Press m or c and the block is whisked away. (If it's a copy, you won't notice it's gone.)

When it's time to find a home for the block, position the cursor, press Set, then m (for move). Blocks may be used one at a time, or Named to create block collections. Press Set, then nb for named block.

PALANTIR is visually oriented and acts in a clear, intuitive manner.

Entire files may also be merged: Read in a file, then again select Read. You're greeted with the slightly hysterical "Work in progress! Add another docu-



ment to the text (Y/N) ?" Answer yes and Read in the file you'd like to merge.

File and block operations, as you can see, are easy. No control keys, no markers to worry about. As elsewhere, *Palantir* is visually oriented and acts in a clear, intuitive manner. No surprises. The program works the way you imagine it should. The backspace key works as in DOS and BASIC; Del deletes as it should, removing the character over the cursor and pulling the line to the left. The Tab key tabs by word or, on a blank line, by tab. The Ins key toggles between Change, where text is typed over, and Insert, which pushes text to the right.

Text attributes and format codes may be Set with wild abandon, but won't distract your view of the text. Attributes the PC is capable of displaying are displayed. Format codes such as indents and headers are normally invisible, but can be displayed by Setting, d, or hidden by Clearing, d. The hidden codes may also be printed along with your text. Nonprinting internal notes are also allowed.

With a monochrome card, Setting underline or boldface produces true screen underlines or high intensity boldface, respectively. The color/graphics card, which isn't capable of underlining, indicates boldface in red, and underlining in blue. (*Palantir*'s color capability, unfortunately, is minimal. While some attributes are shown in color, foreground or background colors are fixed as white on black. Perhaps the next version of *Palantir* will allow color selection. Until then, RGB owners will need to contact Designer Software for information on which byte to troubleshoot for more colorful words.)

TEXT attributes and format codes may be Set with wild abandon.

If your PC has both monitor cards, simply make two versions of *Palantir:* one color and one monochrome. *Install*, the program run when using *Palantir* for the first time, lets you select color or monochrome display, select drives for *Palantir* and text, and choose a default printer. (You can change printers from within *Palantir.*) *Install* then copies only the *Palantir* programs you need to a master disk. From then on, the master disk is *Palantir*, at least until you install a different version.

Back to the Edit screen. Cursor keys move the cursor. For quicker moves, press Home (on the keypad) and the cursor moves to the beginning of the line. Press Home again and the cursor moves to the start of the first line on the screen. Press Home once more, and the cursor moves to the start of the last line on the screen. (Home may also be Set as often as you wish. The new "home" for your cursor is then found simply by Finding (F5) Home, a nice feature when wading through long documents.)

Tab moves you forward by word. Cursor right, followed by Home, takes you to the end of the current line. The only move not available is back tab by word.

But if you'd rather scroll, the function keys F4, F6, F8, and F10 scroll text by line, screen, page, or document. F3 reverses the scroll direction arrow. Press F6 to scroll ahead (or back) one screen. Press F8 to scroll ahead (or back) one page. Document (F10) quickly takes you to the end or beginning of the document.

F5 is Format. Press Format to reformat from the cursor location to the end of paragraph. To reformat an entire document, put the cursor on the document's top line, then press Format. Or, you can Set Format to change the Format parameters mentioned earlier.

Find (F5) also functions on two levels. At its simplest, Find locates any character. Press Find, then a period. If there's a period in the direction of the scroll arrow, Find will place your cursor under it. More sophisticated Finding is done by pressing Set, then Find, as you probably guessed.

Pressing Set, then Find lets you find anything: words (not upper- and lowercase sensitive), phrases, lines, pages, character groups (case sensitive), wild cards, special characters or hidden format codes. You may Find, Find and Delete, or Find



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and Replace. Each may be done once, a specified number of times, throughout a document, or on a case-by-case basis. Replacing is done in Quiet or Noisy mode. Noisy is slower, due to massive on-screen formatting. Quiet mode replaces without showing you the gory details. As a result, it's much faster (though less fun to watch).

PALANTIR'S color capability, unfortunately, is minimal.

Text creation is fast, but you won't get ahead of the cursor, no matter how fast your fingers fly. You also won't be limited horizontally: maximum width is 250 characters and horizontal scrolling is fast and simple. Select Manual justification to prevent word wrap-around; then quickly edit program listings or spreadsheets. Decimal tabbing is available to quickly align columns of numbers.

Last, we come to Lexicon (F9). Lexicon allows you to create libraries of words or phrases, then insert them into your text with two keystrokes. Press F9, then the letter or digit associated with the entry. *Palantir* beeps, and the phrase is inserted. Lexicons hold up to 36 entries. Each entry may be a maximum of 250 characters, and any number of specialized Lexicons may be created.

Close Inspections

Let's browse some more. Hit Esc for the main menu. This time we'll try File.

The File menu gives access to a number of utilities without exiting *Palantir*. Files may be Copied, Erased, or Renamed. Drive directories can be displayed, with full use of DOSisms, such as *.BAS or WH??.*. You may even change disks, including the disk containing the file you're currently editing.

The menu standout is Inspect, which allows you to scroll through a file while editing a different file. The familiar "Any Key" option pages through the file. Hitting the space bar steps up one line at a time. Pressing 0 through 9 scrolls the file at one of nine speeds. Press a different number and scrolling speeds up or slows down; 9 is quite fast; 0 is a snail's pace. Mix and match to read what you're interested in, or quickly page through the file. The convenience of Inspect is almost worth the trouble of loading *Palantir* just to read files. Not quite, but almost.

Inspection complete, we're back to the File menu. Main (Return to Main Menu) is highlighted. Punch the Return key twice and we're back in this article. Hit Esc for the main menu. Browse awhile. What looks good? How about Type?

The Terrible Typewriter

Type is a lousy typewriter, a fact *Palantir* makes no bones about. As the manual cheerfully admits, Type combines the worst features of both typewriters and word processors. Basically, Type lets you type words on a screen. When you press Return, the words are sent directly to your printer. It's too bad if you made a mistake, even backspacing isn't allowed.

There's a reason for this apparent madness. Because *Palantir* stays offstage, your typing is received by the printer without interference. This enables sending control codes directly to the printer. Type is the one area that requires two strokes of Esc to exit. The first press of Esc usually signals the start of a printer control code. Next, type the characters that instruct your printer to produce, say, double-wide characters. Now press Return to shoot the control code to the printer.

TYPE IS a lousy typewriter, a fact Palantir makes no bones about.

Finished? Press Esc twice and you're back on the main menu.

Type is another feature you may never

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use. But it's reassuring to know you can access absolutely every bizarre and wonderful feature of your printer, assuming you know the correct control codes. Back to the main menu again. Now what looks good? How about Print?

Printing

The options continue on the Print menu. Press Return for the default; begin Printing. Or make a choice. Select columns to skip before printing (offset), print a range of pages (maybe pages 5 through 8), or print multiple copies, one after another. (Only 32,000 copies are allowed, however.) Possibly request a pause after each page to change single sheets. Tired of dot-matrix? The Select Printer option allows you to select a printer other than the default printer chosen during Install.

If your printer prints proportionally, a proportional print font file is probably packaged with *Palantir* for possible replacement of your present printer font file. (Sorry about that.) There's also a generic printer named Builtin that does almost everything the higher priced spreads do.

An aside: *Byte* magazine, in the May 1983 issue, compared four word processors for the PC: *Easywriter II*, *Volkswriter*, *Wordstar*, and *The Final Word*. One of the comparisons was, "Transition time from edit mode to printing start (includes answering queries as fast as reasonably possible)." The file to be printed was 28,469 characters. The worst time, 1 minute and 35 seconds, was by *The Final Word*. *Final Word*'s time (with formatting included) was 4 minutes, a long time, indeed. Of the four, *Volkswriter* furnished the best time: 16 seconds. *Easywriter II*: 25 seconds. *WordStar*: 60 seconds.

Palantir, with a file the same length, performs the same feat in only 12 seconds. *Palantir* doesn't require naming files before creation, or saving files before printing.

Inside Palantir

Palantir, like *WordStar*, is a collection of machine language overlays that shuttle in and out of memory. The text also shuttles in and out, usually without your notice. The PC's display is really a window into a RAM buffer that holds only some of your file, or all of it, if it's a short file.

The benefits of this scheme are many. Because only part of *Palantir* is in memory at any given time, there's more room for text. In theory, document length is limited only by free space on disk. In practice, 20K is a reasonable maximum length, due to delays of frequent disk Reads and Writes.

Program overlaying and general program operation are smooth and quick. Because *Palantir* is not copy-protected, use with hard disks gives faster operation, and RAM disks result in operation at "Warp 9, Mr. Sulu"—word processing at the speed of heat. *Palantir* works with up to 16 logical drives; both hard disks and RAM may comprise some, or all, of the dries. In other words, your hard disk or RAM disk may appear, to *Palantir*, as a number of smaller, separate drives.

If you've investigated DOS 2.0, you may be familiar with the concept of "drivers." Drivers are short collections of specifications for different devices. Monitors, printers, modems, and even popcorn poppers (if attached to your PC) are all devices. Device drivers, then, are short series of code that help the PC get a good grip on things.

When you install *Palantir*, you're selecting drivers: a monitor driver and a printer driver. If your old word processor wouldn't work with your printer, the fault was probably an incorrect or nonexistent driver. Drivers are almost as important as the word processor itself, unless you're not planning on printing your creations.

A GENERIC printer named Builtin does almost everything the higher priced spreads do.

Printers

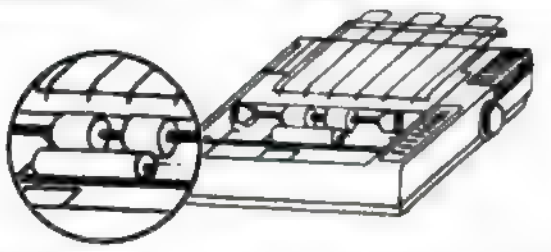
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approach to the question of drivers. Because *Palantir* is used with a multitude of printers, Designer has decided to fully support a multitude of printers. Figure 5 details printers currently supported. NEC single and twin sheet feeders are also supported. If your printer isn't on the list, it is a rare printer.

Unlike MicroPro, home of *WordStar*, Designer doesn't charge for drivers or for the customization notes it has spent many months assembling. Designer believes in selling word processors, not drivers or technical notes—a truly radical idea.

Palantir dealers stock all drivers. The *Palantir* package you receive contains drivers for all popular printers. If your particular printer driver is missing, contact your dealer. Both the Epson and Epson/IBM printers are fully supported.

Designer Software is toying with the idea of throwing all of its drivers, technical specs, hints, and tips into one disk collection, then offering the collection for $10 or $15. Or making the collection available, free, to users' groups for access by any *Palantir* owner. "Why should users have to reinvent the wheel?" they ask.

Figure 5: Because most printers follow a few standard conventions, entries such as "Qume-type printers" cover a number of printers. These printers listed above represent most, if not all, popular printers.

Printers Supported by *Palantir*

Epson MX-100
Epson MX-80
Epson/IBM
Epson FX-80
Epson FX-100
IDS 560
Malibu
All Diablo printers
All Diablo/Xerox printers
Anadex DP9501
Radio Shack Daisy II
Ricoh/Radio Shack Daisy
All NEC Spinwiters (including the NEC 3550 and single/twin sheet feeder models)
NEC PC 8023A-C
IDS Prism (correspondence and draft)
C. Itoh Prowriter
Sony Printer
All Qume and Qume-type printers
Sellum
Okidata Microline 83A
Brother
Daisywriter
All Leading Edge printers
Smith Corona TP-1

Instructions

Designer Software's high standards strike again with *Palantir*'s documentation. The manual has two main sections. First is a thorough discussion of *Palantir*; editing, printing, and *Mailout* are each covered in depth. The writing is clear and conversational. Next is a series of tutorial lessons geared for the complete novice.

Anyone who has never used a computer will find the tutorial a great blessing. Most others will skip it; the first section, along with use of the program (and 25 help screens), provides all the instruction necessary.

A good index, table of contents, quick reference card, and clever surprise are also included. All programs should have clever, pleasant surprises.

Mailout

If you do large amounts of mass-mailing or hacking), *Mailout* alone may be worth the price of admission. If you don't, you may never use *Mailout*, but it's nice to know it's there.

Mailout does amazing things. It effortlessly prints custom letters or documents using data files, *WordStar/MailMerge* files, *Palantir*-created files, BASIC format data statements, or real-time input.

"Real-time" allows you to insert custom addresses, greetings, phrases, or paragraphs during the actual printing process. Nonprinting notes may also be included in the text: "Okay, George, now type in the address, press Return and watch the letter print." Files can be chained together at print time, or nested within other files for elaborate printing schemes.

Mailout is not merely a few selections on a *Mailout* menu. *Mailout* is a language, much like BASIC or Pascal, only simpler; It is analogous to *dBase II*.

Mailout's major functions are file nesting, variables, and conditionals. Nesting takes care of data file inclusion, chaining, and inserting files within other files.

Variables are similar to variables in BASIC and other languages. Variable names are first Set, then take on a text "value" of up to 250 characters during printing. What looks like "Dear VNAME" in your *Mailout* letter may become "Dear Mr. Jones" in the first letter printed, then "Dear Mr. Smith," then "Dear Mr. Stanislowski," and so on.

Don't turn up your nose yet. Variables may be calculated with commands such as SET MEAN = (VAL1 + VAL2)/2. Conditional commands using the operators greater than, less than, equal, not equal, etc., are allowed. Compound conditionals that use AND and OR are allowed. IF is allowed.

The results of the above may be lines like the following:

```
NEXT IF NOT (STATE = CA)
NEXT IF RECORD <= 100
NEXT IF RECORD > 150
IF COUNT < 8 SET COUNT = COUNT
+ 1; RESTART
SET COUNT = 0; NEXT
```

Fortunately, *Mailout*'s ins and outs are clearly explained and easier to use than the example might indicate. Like any language, though, *Mailout* takes some getting used to.

Mailout includes some truly helpful and clever adjuncts. If you don't need mass-mailing, you could always use *Mailout* to write a database.

Conclusion

With the exception of multiple text windows and the ability to backtab by word, *Palantir* has most of the features anyone could ask for. Full-featured word processors, however, abound in the crowded PC marketplace.

What sets *Palantir* apart is elegance of operation. Multiple on-screen status lines aren't needed, nor is retraining for occasional users.

The combination of simplicity and power is often claimed but seldom realized. *Palantir* justifies that claim, for an admittedly steep price. If you're willing to spend $450 for a word processor, *Palantir* should prove to be a worthy investment.

/PC



"Frankly, you couldn't pay me to use this software."

— **Shirley Rogers,** Controller, Cybernetic Data Products, Inc.

Shirley Rogers takes her job as Controller for Cybernetic Data Products very seriously.

So when it came time for her to computerize her firm's accounting procedures, she studied every available software option thoroughly. And we're happy to report that she chose *Legend*.

Fact is, *we* know that *Legend* is the finest accounting software you can run on a microcomputer. Because it has the power and versatility of systems found in Big-8 accounting firms. Even still, we were more than a little curious what it was about the program that most attracted Shirley. So we asked her.

"Cybernetic Data Products is an extremely report-intensive company. So when I went shopping for software, my first criterion was a program that can generate reports—quickly and easily. *Legend* fit the bill perfectly because it allows me to define and create thousands of different types of reports, in detail or in summary form.

"Plus, since I was new to computers, I was after an accounting system that was easy to use and simple to operate. Most of the software I tried was reputed to be 'user-friendly.' In reality, they were impossible to figure out and cumbersome to operate. I had *Legend* up and running in minutes. My hat's off to the folks who wrote the instructions and made the program such a joy to use.

"When you've been doing accounting for years, the last thing you want is to have to learn a different way of doing things to accommodate the software. *Legend*, on the other hand, has adapted perfectly to *my* way of doing things."

The System and its components. The *Legend* system consists of five programs in three modules: General Ledger, Accounts Receivable/Order Processing/Inventory Control, and Accounts Payable...and may be purchased as an entire system or individual modules. Some highlights:

General Ledger

- Maintains period and year-to-date account history.
- Prepares statements by department and cost center location.
- Generates summary and detailed statements.
- Provides fail-safe automatic audit trails.
- Prepares budget figures for account and period.

Accounts Receivable/Order Processing/Inventory Control

- Analyzes cash flow by net due date and discount date.
- Produces overdue listing in customer or representative sequence.
- Provides sales statistics with previous year comparison.
- Allows individual payment terms for each customer.
- Interfaces to General Ledger.

Accounts Payable

- Automatically flags items to be re-ordered.
- Reports product profitability by previous, current, and year-to-date.
- Allows payment selection by net date and discount date.
- Discount analysis to aid payment selection.
- Provides details of balance, order information, and exceptions. Interfaces to General Ledger. And much more.

Links to your software. As you can see, *Legend* is a complete and highly flexible system that was designed with the features recommended by CPA's. What makes it even more valuable is that, by adding an inexpensive linker, you can provide an interface to software you're already using...like WordStar; Lotus 1, 2, 3; dBase II; and even BASIC.

With all this going for it, it's no wonder that *Legend* is fast becoming the world's most popular accounting software. See it today at finer software dealers or write directly to Base Technology Corporation.

And we'd like to thank Shirley for lending her observations to this ad. Even still, she wanted to have the last word: "You couldn't pay me to use this or any other software. I don't believe in handing out endorsements lightly. But when I find a product that exceeds my expectations in every single respect, I would gladly pay twice the asking price. *Legend* is a bargain!"

Thanks, Shirley. We couldn't have said it better ourselves.

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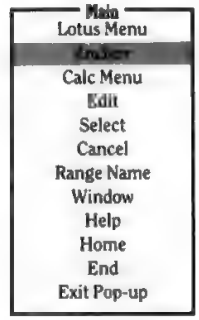
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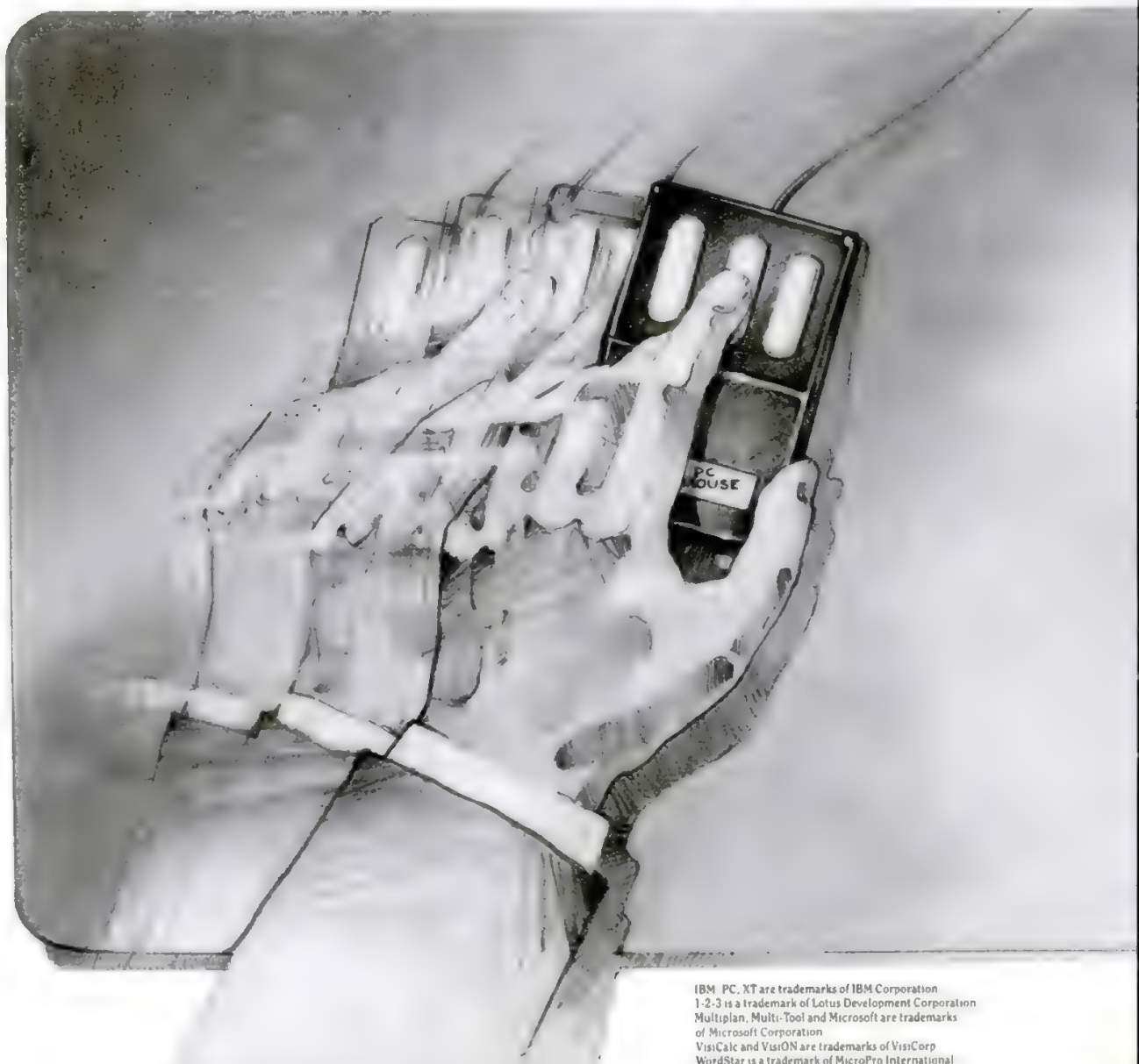


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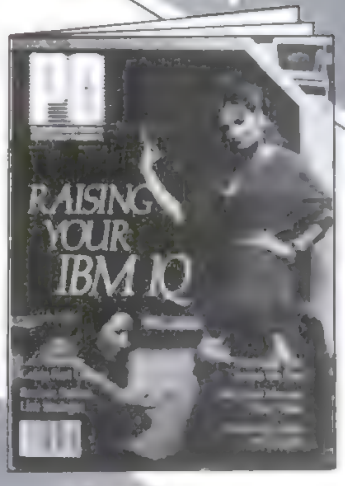
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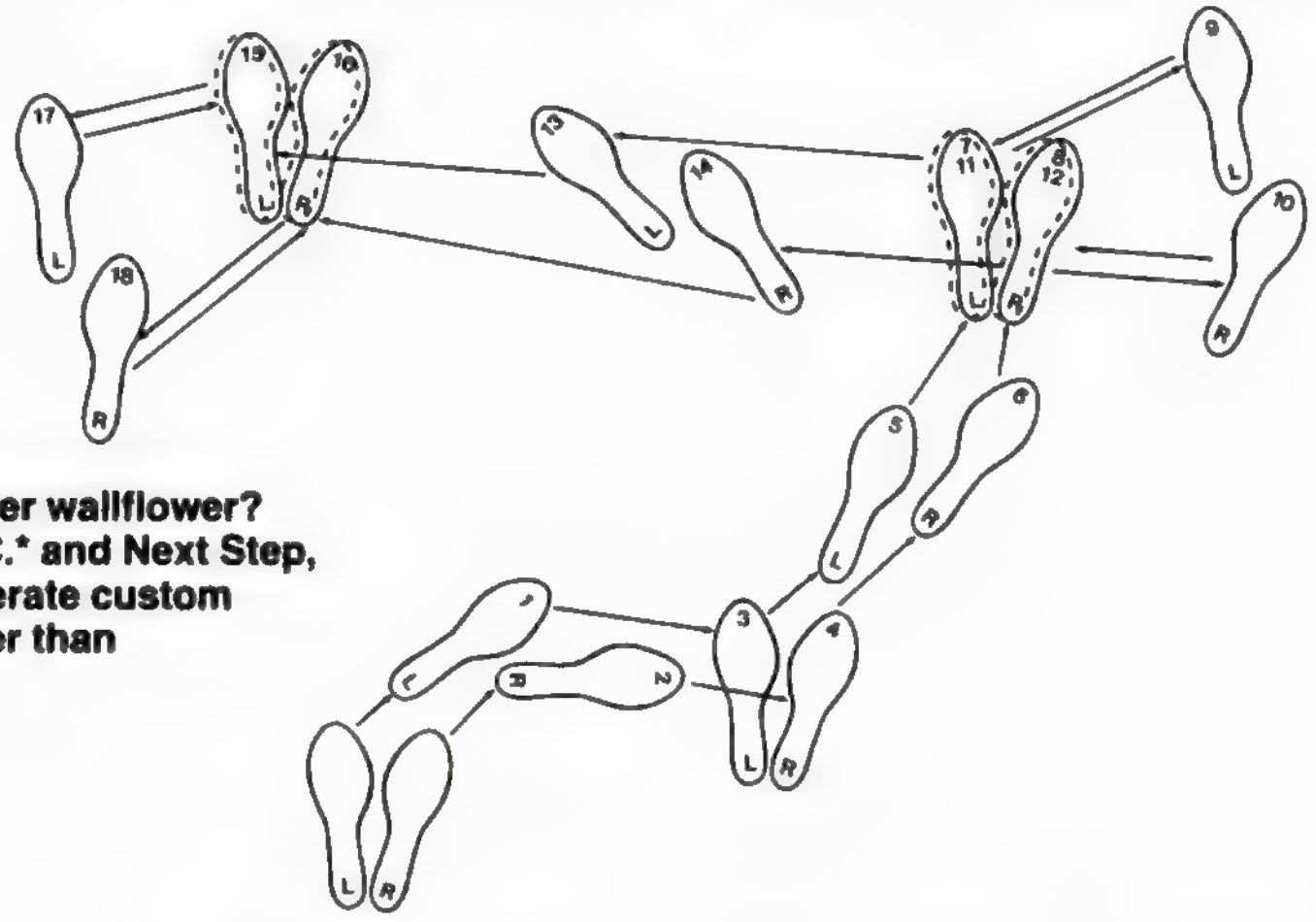
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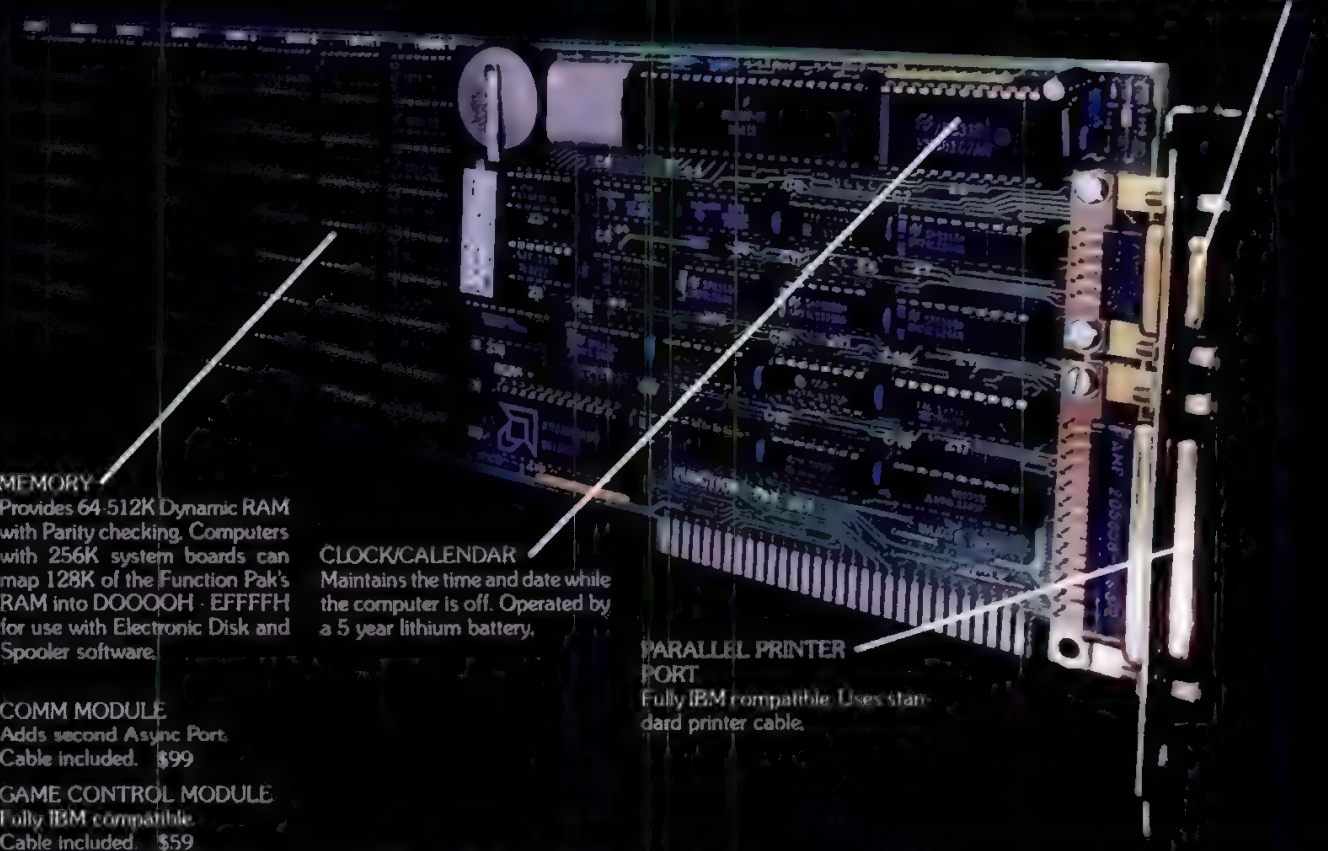
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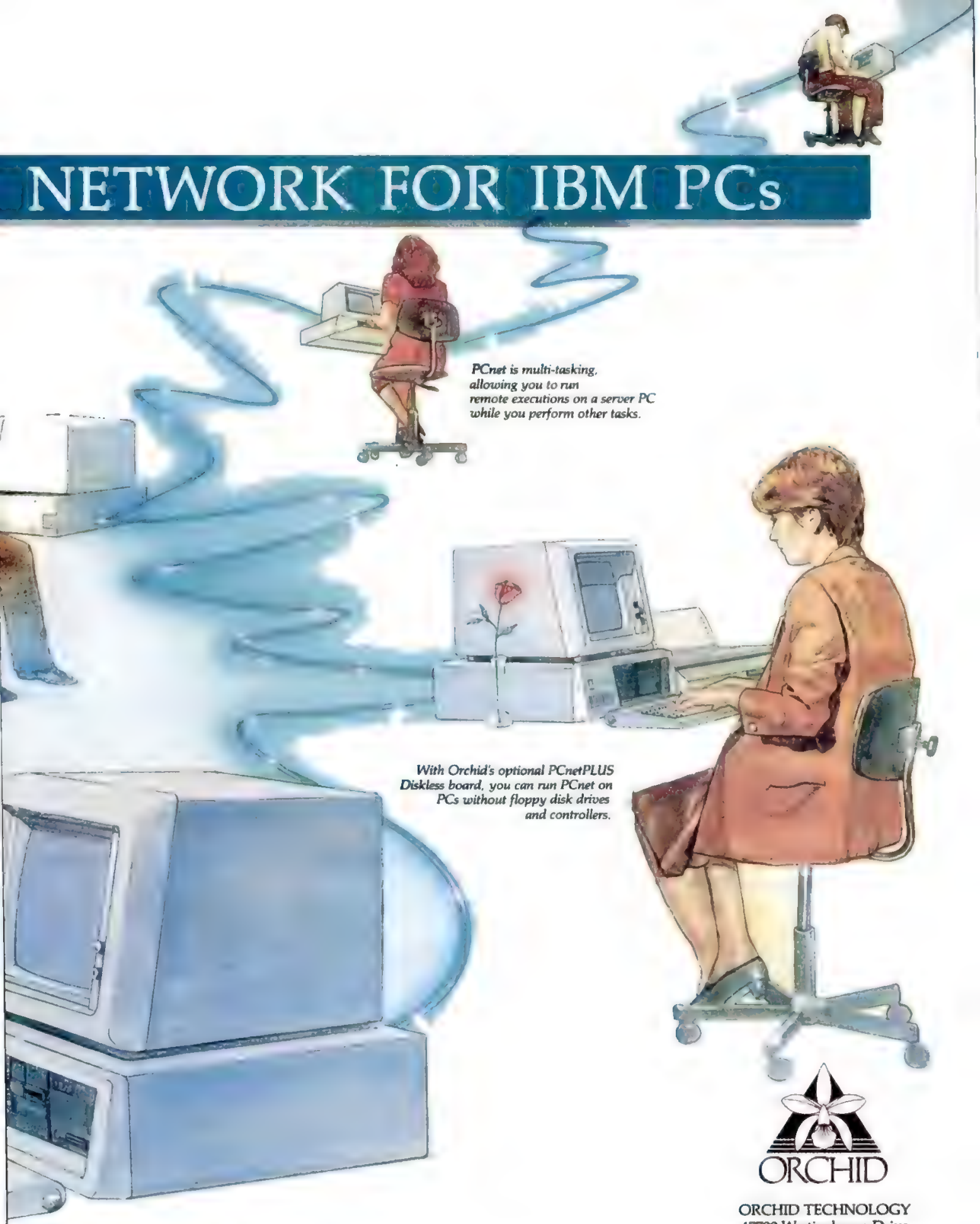
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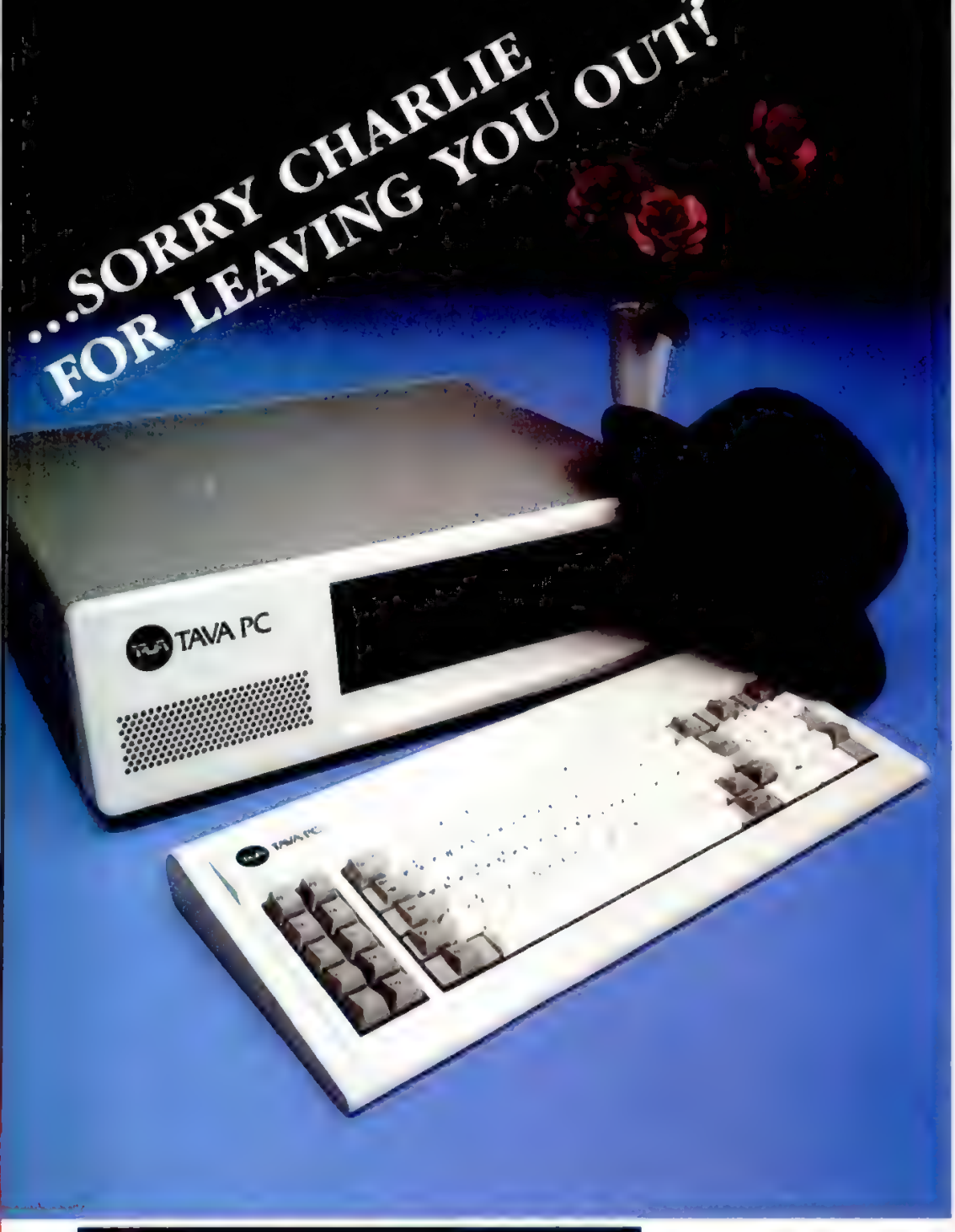
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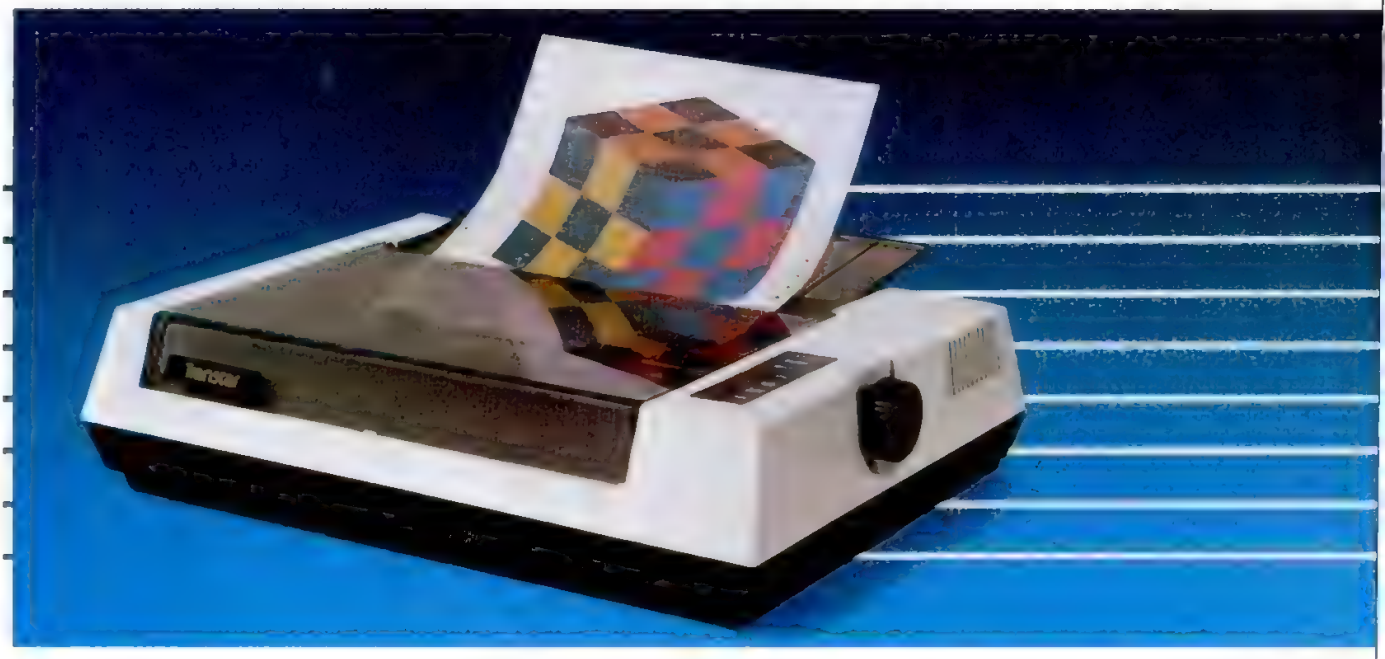
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Once limited to the mainframe environment, the programming language LISP is now available in two implementations for the PC: IQLISP and muLISP.

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The programming language LISP is to Artificial Intelligence (AI) programmers what the C language is to UNIX programmers—both a primary tool and a guiding philosophy. It has been used to implement natural language processors, expert systems, programs to manipulate mathematical models symbolically, and to create new languages for AI research. Its syntax and interpretive nature allow programmers to create programs that can manipulate many forms of data, as well as other programs, and to change the program's behavior on the fly. Such freedom is necessary in the AI field, where researchers implement complex systems as evolving experiments; the purpose of a program is not always to solve problems but sometimes to aid in understanding them. Because AI programmers have taken such a different approach to programming, they have in the past operated as a community apart from the mainstream of computer science. Lately, however, their techniques are finding commercial applications in such diverse fields as mineral exploration, medical diagnosis, and computer configuration. Many of these applications will be moving into the microcomputer marketplace, now that the proper tools are available and within the means of even "cottage" programmers. Among these tools are two powerful LISP systems for the IBM PC: Integral Quality's IQLISP and Soft Warehouse's muLISP-82 (also marketed by Microsoft).

A Brief History

LISP, which stands for LISt Processor, began life as a paper by J. McCarthy at the Massachusetts Institute of Technology. The paper outlined a method for solving symbolic logic problems, and from it, McCarthy developed the programming language LISP. His research group went on to develop the first working LISP interpreter, documented in 1963 in the *LISP 1.5 Programmer's Manual*. Other manufacturers immediately began implement-

Recursive Functions

A number of programming languages use these functions, but not to the extent that LISP does. Here's an illustrative program.

The language LISP has many strange (but necessary) features. Not all of them are easy to grasp. Recursion is the basis for most repetitive processing in LISP, because it is mathematically elegant and it is easy to use once understood. Pascal, C, LOGO, and PL/I provide recursive functions, but don't emphasize these functions to the degree that LISP does, so not everyone is acquainted with the concept. A simple example will help to illustrate it.

Suppose you want a program that counts daisy petals as a measure of someone's affection for you. This could be done with a countdown loop and an alternating flag or by determining whether the number of petals is even or odd, but it's more interesting to recurse it. The three functions below, used together, will do the job.

The utility functions used are LE, which checks if its first argument is less-than-or-equal to its second argument; SUB1, which subtracts one from its argument and returns the result; and EQ, which is an equality test. Briefly, DOES_S/HE_LOVE_ME starts the countdown by calling S/HE_LOVES_ME with PETAL_COUNT. S/HE_LOVES_ME will check to see if the petal count it was given is less than or equal to 1 (success); if so, it returns the string "S/HE_LOVES_ME" to its caller; otherwise it returns the result of calling S/HE_LOVES_ME_NOT with petal count decremented by 1. S/HE_LOVES_ME_NOT checks to see if the petal count is 1. If so, it returns "S/HE LOVES ME NOT"; if not, it decrements PETAL_COUNT and returns with it the result of calling S/HE_LOVES_ME. This continues until PETAL_COUNT reaches 1. A zero or negative initial PETAL_COUNT will be caught by S/HE_LOVES_ME in the first cycle (an unfair advantage, but love is at stake, after all). The two functions recurse to each other, S/HE_LOVES_ME calling S/HE_LOVES_ME_NOT and so forth, to completion.

—*D.T.M.*

```
[DEFUN DOES_S/HE_LOVE_ME (LAMBDA (PETAL_COUNT)
    (S/HE_LOVE_ME PETAL COUNT)
]

[DEFUN S/HE_LOVES_ME (LAMBDA (PETAL_COUNT)
    (COND
        ((LE PETAL_COUNT 1) "S/HE LOVES ME!")
        (T (S/HE_LOVES_ME_NOT (SUB1 PETAL_COUNT)) )
]

[DEFUN S/HE_LOVES_ME_NOT (LAMBDA (PETAL_COUNT)
    (COND
        ((EQ PETAL_COUNT 1) "S/HE LOVES ME NOT!!")
        (T (S/HE_LOVES_ME (SUB1 PETAL_COUNT))  )
]
```

ing their own versions, merrily extending LISP in all directions. After 20 years, three mainframe versions have emerged as *de facto* standards: MACLISP (an extension of McCarthy's work at MIT), UCI-LISP, and INTERLISP. These implementations have strong similarities, differing mainly in their system interfaces and more complex features. Of the two LISPs reviewed, IQLISP most resembles UCI-LISP; muLISP is based on the original LISP 1.5.

Until recently, LISP was available only on medium-to-large mainframe computers, such as the DEC-10 and IBM 370. Applications such as Mycin, the medical diagnostic program; Prospector, the mineralogical data analyzer and mine-site finder; natural language translators; and symbolic mathematical systems could be used only on large machines. By the late seventies, some specialized one-person AI computers had been developed, and muLISP-77 (the ancestor of the muLISP for the PC) had been implemented on a microcomputer. By 1980, muLISP and a few other implementations were available running under CP/M, but nothing was available for a large-memory 16-bit microcomputer. LISP is a memory-hungry interpretive language, and small machine versions were not powerful enough for many applications. IQLISP and the IBM PC version of muLISP have, however, solved that problem.

LISP Data Structures

LISP provides several types of data: numbers, literal atoms, character strings, and lists. Values of any of these types may be assigned to variables, passed to functions, and compared to similar values. All of these data types are supported by IQLISP and muLISP.

IQLISP supports three kinds of numbers: short (16-integers), floating-point numbers, and infinite-precision integers,

LISP is a memory-hungry interpretive language.

which can be up to tens of thousands of digits long. MuLISP supports only infinite-precision numbers. In both versions, numbers may be added, subtracted, multiplied, divided, and subjected to numerous other indignities, and the integer types can be used in a range of number bases—bases 2 to 16 for IQLISP, 2 to 36 for muLISP. MuLISP does its floating-point operations in software; but IQLISP, developed specifically for the IBM PC, will do its arithmetic on an 8087 co-processor if one is handy, performing its math functions at, potentially, a much faster speed.

Literal atoms are similar to English words in appearance and use. DOG, PLUTONIUM, and A-B-C_123 are legal literal atoms. In both IQLISP and muLISP, literal atoms may have names of nearly infinite length, but, in my estimation, any name that takes more than 10 seconds to enter is too long. Just as the word *red* can repre-

sent a color or a political system, depending on its context, the "value" of a literal atom can represent whatever your program chooses for it. Since a literal atom is stored and used as a special kind of pointer, it can be manipulated much more efficiently than a character string. There is a string associated with each different lit-

UNTIL recently, LISP was available only on medium-to-large mainframe computers.

eral atom, which is indicated by the pointer and called the printname, or "pname." LISP prints out this name when you type the atom on a terminal.

Character strings are handled differently in IQLISP and muLISP. MuLISP extends the usage of the literal atom's pname string, providing substring extraction, length, and substring finding functions. IQLISP provides quote-enclosed strings similar to BASIC strings, manipulated with similar functions to muLISP's (IQLISP adds a string concatenation function). Both languages allowed extremely long strings.

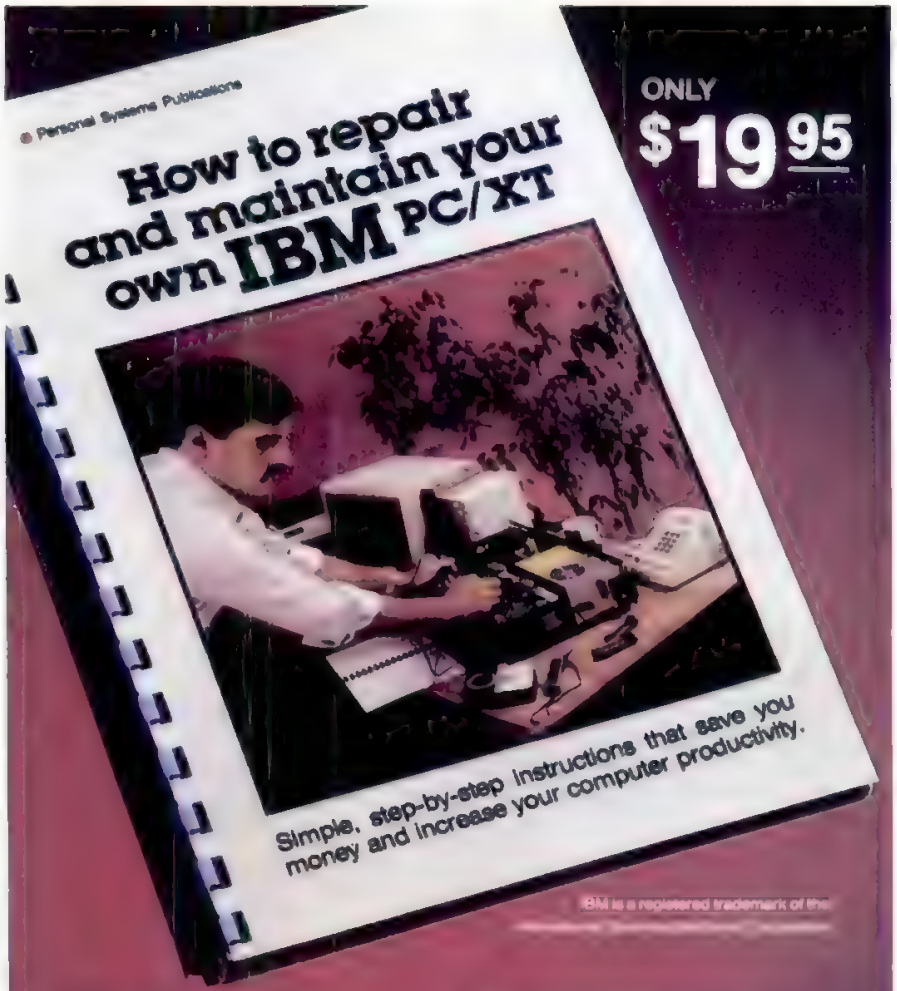
The most useful, and potentially the most complex, data type in LISP is the list. Lists can be as simple as a group of atomic data items, as in:

```
(3.14159 APL PI WITH CHEESE)
```

or as complex as:

```
( (TOO (MANY (*!*) ((PARENTHE-
SES)) ]
```

which is a list containing several nested lists. The right square bracket ( ]) acts as a superparenthesis, closing all preceding open parentheses. Lists can be combined to form any necessary data structure: arrays, Pascal-like records, trees, queues, stacks, and even grocery lists. They can be put together and taken apart in short order by using LISP functions. Both IQLISP and muLISP provide generous sets of list management functions. The main difference between them is that the potential size of



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an IQLISP list, as a result of its 640K memory addressability, is much larger than a muLISP one.

IQLISP supports arrays directly, rather than requiring a programmer to write list-based array manipulation functions. It provides five kinds of arrays, which support five kinds of data, from byte-sized integers to lists. IQLISP's array storage mechanism is more space-efficient for small numbers than a similar set of user-coded functions, and the array element store and retrieve functions are much faster than equivalent list-based functions.

THE function COND is LISP's answer to the if-then-else statement.

One final useful data structure that both muLISP and IQLISP support is the property list. Each literal atom may have a list of properties with flags attached to it, which are used by the programmer to carry extra information without much space penalty. Properties have the form:

```
(property-name value)
```

A sample property for DOG would be:

```
(NUMBER-OF-LEGS 4)
```

A flag is a property with no associated value; its presence or absence is used as an indicator.

LISP Control Structures

LISP supports a variety of control structures that make programming easier, including expressions, if-then-else tests, loops, recursion, and features that are useful only in a list-based language. IQLISP and muLISP differ in this area more in the style of their offerings than in the substance.

A LISP program is a function, a named unit of code to which you pass arguments and which, in turn, hands you back a value. A function call is written as a list comprised of the function name followed by values to be passed as arguments. A user function definition looks like this:

```
(DEFUN function-name (LAMBDA
   (argument-list)
   (function body)
   ) )
```

and its call would be written as:

```
(function-name arg1 . . . argN)
```

Expressions in LISP are calls to user-defined or built-in functions. Adding two numbers in muLISP, for example, is entered as:

```
(PLUS 29 -362435921410)
```

or, in IQLISP, like this:

```
(+ 1.1E+10 22000.0)
```

Most punctuation characters are allowed in IQLISP names and, to a lesser extent, in muLISP's. All control structures are LISP

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LISP Benchmarks

Two versions of LISP run through PC's benchmark tests.

LISP can be used for building very large and complex applications, and, if used correctly, it can be very efficient. To check out IQLISP and muLISP quantitatively I tried three of the PC benchmark tests (See "Micro-Linguistics: Languages for the PC," PC, Volume 2 Number 4). I left out string concatenation as muLISP didn't have it, and my own CONCAT would have slowed it down. And, as neither LISP had good record-level I/O, I left out the file test. I also tried out the IQLISP floating-point operations. Following are sample functions and times.

Empty loop in IQLISP:

```
(DEFUN BENCH1 (LAMBDA ()
      (SETQ TIMER (DTIME))
      (FOR ICNT FROM 1 TO 10000 BY
         1)
      (- (DTIME) TIMER)
)
```

Empty loop in muLISP:

```
(DEFUN BENCH1 (LAMBDA ()
      (TIME T)
      (SETQ ICNT 1)
      [LOOP
            ((GREATERP ICNT 10000)
               NIL)
            (SETQ ICNT (PLUS ICNT
               1)) ]
      (TIME NIL)
)
```

Essentially the same functions, with additional lines of expressions for integer or floating-point operations, were used for the integer counting and floating-point multiply/divide tests. The results are shown in Figure 1.

The empty loop and the integer count-up are the same program, run 10,000 times and 32,767 times, respectively. IQLISP had the larger startup time (by), but had a much smaller jump from the first test to the second. MuLISP's startup time was small; it ran fairly fast, but had a larger time increment. The floating-point run for IQLISP was very slow, as was the floating-point emulation in LISP. I assume that an 8087 co-processor would increase the speed by more than 100 times if IQLISP took proper advantage of it. —D.T.M.

functions, giving all LISP programs a uniform appearance. Since functions and expressions appear in list form, they themselves can be modified with list-manipulating functions. Used with care, this feature can enable you to write powerful programs; one such function is the INTERLISP function DWIM (Do What I Mean, not what I say), which cleans up common typos and errors in newly entered LISP programs.

One of the best features of LISP is recursion. A recursive function works by solving part of a problem and then calling upon itself to do the rest; it's like cloning oneself for help on a large job. Recursive functions are most useful for working complex data structures step-by-step.

The function COND is LISP's answer to the if-then-else statement, allowing a program to selectively execute one of a number of functions associated with a series of true-or-false tests. An IQLISP function using COND to pick one of a set of tools to use with a piece of hardware would look like this:

```
(DEFUN PICK_A_TOOL (LAMBDA (ITEM)
    (COND
          ((EQ ITEM 'NAIL)
             (USE 'HAMMER))
          ((EQ ITEM 'SCREW)
             (USE 'SCREWDRIVER))
          ((EQ ITEM 'EGG)
             (USE 'FRYING-PAN))
          (T (TELEPHONE 'RE-
             PAIR-PERSON))
)
```

Only one of the above USEs or TELEPHONEs will be executed, depending on the value of ITEM; if none of the EQs find a match, T, which is always true, will act as a catchall clause. (The literal atoms in this example are preceded by single quotes, to allow IQLISP to distinguish them from a variable such as ITEM; in muLISP the QUOTE function is used.) IQLISP also provides a case-statement-like LISP macro. MuLISP provides both an explicit COND, as above, and an implicit form for user-defined functions. This second form merely saves a few keystrokes and can make code less readable, so I prefer not to use it.

THE IQLISP editor is similar in style to a line editor, but, using it is like trying to prune a bush while standing inside of it.

Since repetitive operations in LISP are usually handled with recursive functions, LISP originally did not provide an iterative looping mechanism. Most LISP implementations added iterative looping to achieve greater efficiency for some cases.

Figure 1: Benchmark test results for IQLISP and muLISP

Test	IQLISP Time(sec.)	muLISP Time(sec.)
Empty Loop	47.67	9.07
Integer Count-up	50.31	32.07
Floating Point Multiply & Divide	1368.52	----

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IQLISP has several loop mechanisms; the simplest of which is the PROG function that allows labels and goto's to be defined by programmers for hard coded loops. IQLISP also supplies a LOOP macro (used as a WHILE or a REPEAT-UNTIL), and a FOR macro, which acts like the BASIC FOR. MuLISP has a LOOP function, similar in appearance to a COND without tests. (It's just a list of functions to be executed.) The loop is exited when any function in the loop that tests a condition returns a TRUE value. Both IQLISP's and muLISP's loops are useful, but IQLISP's macros are more self-documenting with their clearly marked exit points; the IQLISP PROG and the muLISP LOOP can lead to hard-to-read code if not clearly commented.

Mainframe versions of LISP provide "macros," which are similar in use to assembly language macros. A macro generates LISP code to be evaluated in place of the macro call. This allows programmers to define new, highly readable data and control structures, which are actually implemented as efficient, but obtuse, LISP code. (The FOR macro generates a fast PROG function, for example.) IQLISP provides both normal and read macros (for special input processing); muLISP unfortunately does not.

To the above routines, IQLISP and muLISP add a few esoteric extras. Both provide mapping operators, which are used to apply a function to each argument of a list of arguments, one at a time. They also have evaluation control functions, and mechanisms to examine and modify the LISP environment. These can be used by a program to backtrack when, for example, it discovers it has made an error.

Interfaces and Programmer Support

LISP system interfaces—to files, terminals, and whatnot—have generally been designed for simple I/O routines, which can be expanded as needed for each application. Available operations include functions to read a character, an atom, or an expression from the input source, to change the current input source to a file, and to do similar output (print) operations. To these, muLISP adds functions to set the output line length, clear the screen, move the cursor, and check the time. IQLISP provides these functions as well as file and directory manipulation, which are separate from the "current input/output sources," IBM PC function key handling and multiple screen windows management. Both muLISP and IQLISP allow the user to add assembly language routines for new system interfaces or performance-critical code. IQLISP even provides a special object-code loader and describes in detail the interfacing of assembly language routines and IQLISP.

Both IQLISP and muLISP offer tools to simplify the developer's job. IQLISP has a development system with a set of libraries and sample utilities; muLISP provides a similar development system, muSTAR, and includes sample LISP programs. The IQLISP editor is similar in style to a line editor, but, unfortunately, using it is like trying to prune a bush while standing inside of it. MuLISP's editor is screen-oriented and, by comparison, easy to use. Both systems provide LISP pretty printers, tracing similar to BASIC's TRON and TROFF, and commands to save and reload all the functions and variables defined since the interpreter was started up. IQLISP adds to this an Error Monitor, which traps and aids in debugging errors; an interface to the PC-DOS DEBUG program for debugging assembly language routines; and a set of functions to support loading and saving of related groups of functions called "packages." With these additional tools and interfaces, IQLISP offers better support than muLISP for development of complex LISP applications on the PC.

BOTH LISP packages came with surprisingly good, indexed manuals.

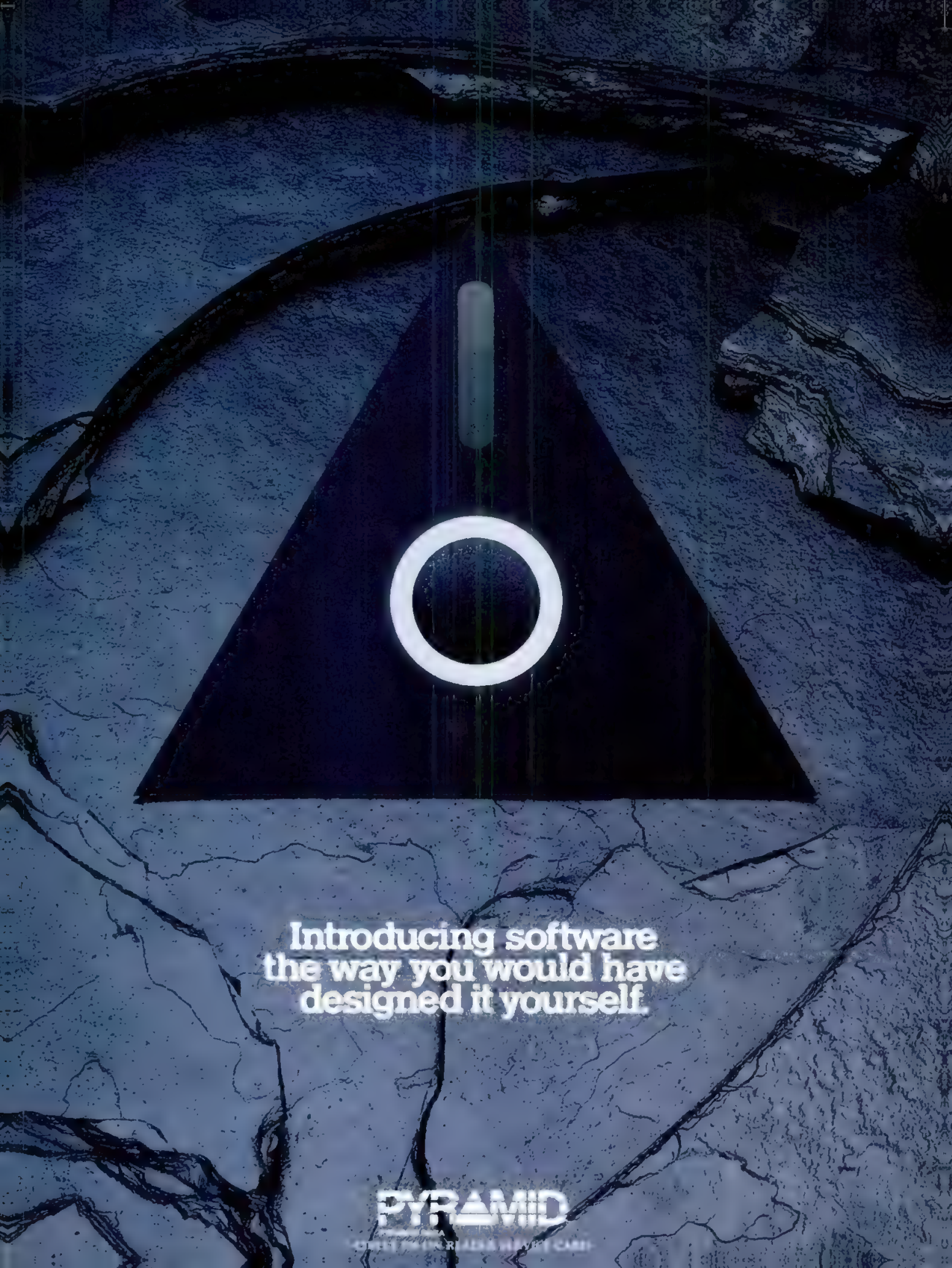
Documentation

Both LISP packages came with surprisingly good, indexed manuals. The writers of both assumed that the reader had a working knowledge of LISP and explained their products in detail. The IQLISP manual was larger and had more information, particularly about the internal structure of IQLISP and about adding assembly language functions. Each chapter had an individual table of contents and function index. The muLISP manual was informative and relatively complete, although some machine-specific information was missing (for example, how large an infinite-precision number could be, which extra characters were allowed in names, and how to interface to and load an assembly language function).

Of the two implementations, I preferred IQLISP overall. The manual was somewhat more complete, the system interfaces and the internals were well described, macros were available, and with the exception of the editor, additional developer support was provided. IQLISP was able to take better advantage of the PC. Its main weakness is that at present it only runs on the PC; IQLISP applications cannot be ported to other machines. When I last spoke with Integral Quality, the company was remedying this limitation, and is working on a LISP compiler for fast code. MuLISP's math functions are somewhat faster than IQLISP's, but its main strength is IQLISP's weakness—it is available on a large number of popular microcomputers most of which are those with 8-bit microprocessors. MuLISP code is thus more portable, but to be fully portable it would have to run on even the smallest system. MuLISP has been extended to take some advantage of the PC, but not to the extent of IQLISP. Making use of the extra memory available in MS-DOS muLISP ties an application to 8088-based computers, which nullifies its advantage. For my money, IQLISP is a better buy for the PC.

Editor's Note: *At press time Soft Warehouse informed us of the release of an update of muLISP-82. The new version, muLISP-83, offers a number of enhancements, including macros, random file I/O, better memory management and an interactive tutorial system. While we recognize that manufacturers are constantly improving their products, it is our policy to review both the currently available product and, once released, the update, provided it offers substantial enhancements over the original.*

David T. McClellan is with Foundation Computer Systems, Inc., a software consulting company in Cary, North Carolina. His interests are computer graphics and Artificial Intelligence research.


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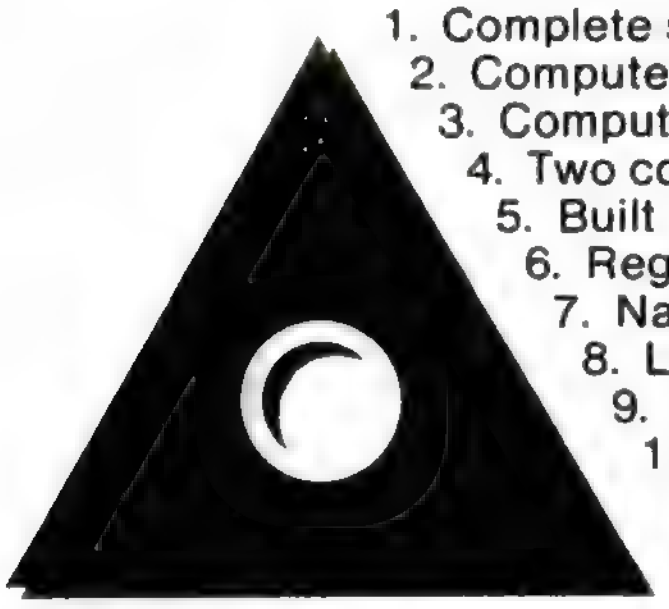
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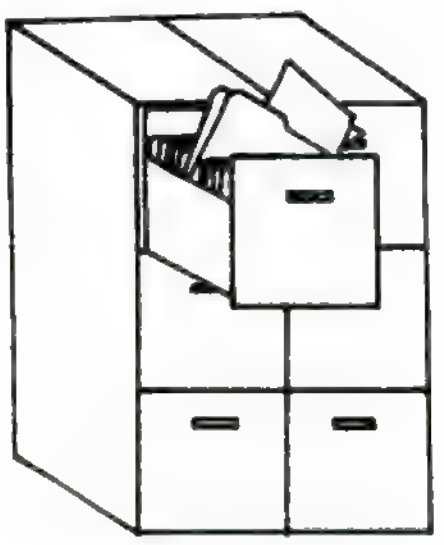
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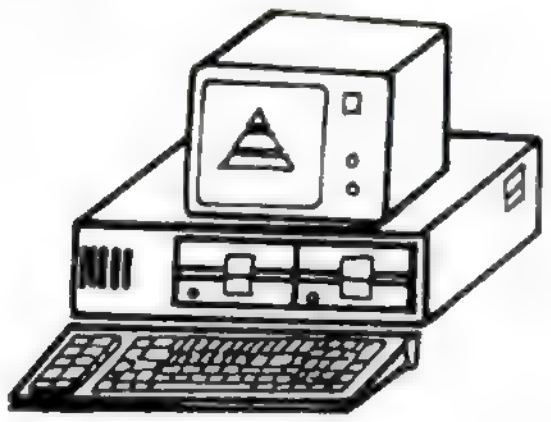
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To the beginner, the programming language FORTH seems like an endless series of puzzles. I've spent the last few weeks learning and using FORTH Level 2 (which is manufactured by FORTH, Inc. and marketed by Forth Technologies) and have discovered my knowledge of BASIC, FORTRAN, and Pascal to be of no help at all. Using FORTH requires an entirely different way of thinking about programming.

The first puzzle about FORTH is how it came into being. In the sixties and early seventies, when the language was developing in the mind of Charles H. Moore, the author of Level 2 and the founder of FORTH, Inc., the trend in computing was toward monster programs written in FORTRAN and running on big machines with huge compilers. Word lengths were growing to 60 or more bits to accommodate double-precision floating-point numbers.

Moore was dissatisfied with the trend; he found that writing a program took him ten times longer than it should have. So he wrote FORTH for himself. FORTH is small, fast, and efficient. It is sufficient for the task at hand—no more, no less.

Unlike other computer languages, FORTH is structured around a kernel of words written in assembly language. Each performs a specific function such as adding two numbers or fetching something from a file. New words are defined by stringing old words together in whatever way you choose. The new words have pointers, or addresses, that direct the computer to the old words. Writing a FORTH program involves writing a word that defines the application. The FORTH 1979 standard specifies the set of words that comprise FORTH. Any FORTH programmer can extend the language by writing new words (or redefining old ones) to suit the purpose at hand.

Words are entered into blocks on the disk. When a block, which contains 16 lines of 64 characters, is loaded into memory, it occupies one kilobyte. Sixteen lines may not sound like enough room for a program, but, in FORTH, most words are only

a line or two long, and using several short words instead of one long one is considered good programming practice. Also, a word often invokes other words that reside in different blocks, so a program, if necessary, can occupy many blocks.

Another feature of FORTH is its use of stacks. Stacks are the basis of programming in FORTH; to help think in FORTH, you can visualize a stack as a vertical row of boxes that hold numbers. As numbers are placed on it, it grows higher; as numbers are removed, it shrinks. This stack in which you enter numbers is called the parameter stack. Entering a number from the keyboard is one way of putting that number on the parameter stack.

FORTH uses Reverse Polish Notation (RPN) to perform arithmetical operations on the contents of the parameter stack. This method, which was developed by the Polish mathematician, Jan Lukasewicz, is also known as post-fix notation, because the mathematical operation is entered after the numbers, rather than between them, as they would be in standard in-fix notation. Many hand-held calculators use this method. To multiply five by three in FORTH's post-fix notation, you would type:

```
5 3 * .
```

The period (.) is the FORTH word for print; the asterisk (*) is the FORTH word for multiply. In post-fix notation sequence, the 5 goes on the top of the stack, followed by the 3, the asterisk, and the period. The asterisk multiplies the two top stack entries, removes them from the stack and places them at the top of the stack. The period removes the top number from the stack and prints it.

RPN eliminates the need for equal signs and parentheses. The expression 5*(4+3)/(2-1) and an order to print the result, would be entered in FORTH as:

```
5 4 3 + * 2 1 - / .
```

If you want to perform this sequence of operations several times, using different sets of numbers each time, you might want to write a FORTH word to perform the operations on the top five stack entries. It would look like this:

```
:FIVOPS - ROT ROT + ROT * SWAP / ;
```

The colon (:) represents the compiler, which compiles everything up to the semicolon (;) and enters it into the FORTH dictionary under the heading FIVOPS. The word ROT takes the third number down and puts it on top of the stack; SWAP exchanges the two top stack entries.

FIVOPS now functions just like any other operation; you have extended the language. Entering

```
5 4 3 2 1 FIVOPS
```

will cause the answer 35 to appear instantly on the screen.

Compiling

FORTH compiles a word by first putting down the number of characters in the word's name, then the name itself

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(some FORTH words use just the first three characters of the name), followed by the addresses in memory of the other words invoked by the word being compiled. The compiler is said to be threaded because the sequence of addresses establishes a trail through the memory, which FORTH follows when it executes a word. When FORTH finishes executing a word, it learns where to go next by getting the address from the return stack, which it entered there when it began execution of the word. Threading is somewhat like a sports car rally in which the directions to the next checkpoint are handed out at the current one. This results in compact programs, since most words just contain the addresses of other words. (Frequently used words are compiled in assembly language.)

Another unusual feature of FORTH is its lack of floating-point numbers and transcendental functions, such as SIN and EXP. The natural language of the computer handles integers or whole numbers, and, FORTH was designed to handle them, too. Any aficionado of benchmarks will appreciate how much faster a program will run if it can be written in integer-only arithmetic. The foldout chart in the September, issue of PC (see, "Micro-Linguistics: Languages for the PC," PC, Volume 2 Number 4) contains benchmark programs that test FORTH and other languages. Except for the floating-point benchmark, FORTH fared quite well.

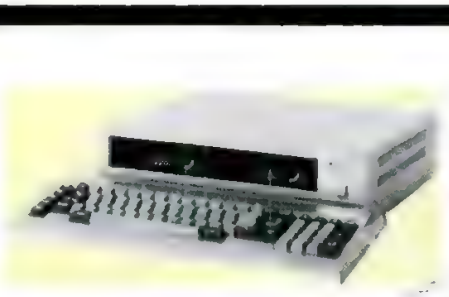
Floating-point numbers are handled in FORTH by scaling. For example, you can eliminate the decimals in balancing your checkbook by figuring sums in pennies (that is, by multiplying all the dollar figures by 100). Scaling can get quite complicated and can result in confusing programs. In some cases, if you want to compute compound interest, for example, you almost have to use floating-point arithmetic. The FORTH answer, in this case, is to buy and use the 8087 floating-point processor chip. Floating-point arithmetic then becomes a natural part of the computer's capabilities. Most versions of FORTH for the PC support an 8087 option.

FORTH Level 2

FORTH Level 2 is a reduced version of the Level 4 professional system, also from FORTH, Inc. Level 2 is about as traditional a version of the language as you will find.

I mention this fact because it explains the philosophy behind this version of the

VISUALIZE a stack as a vertical row of boxes that hold numbers.




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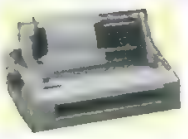
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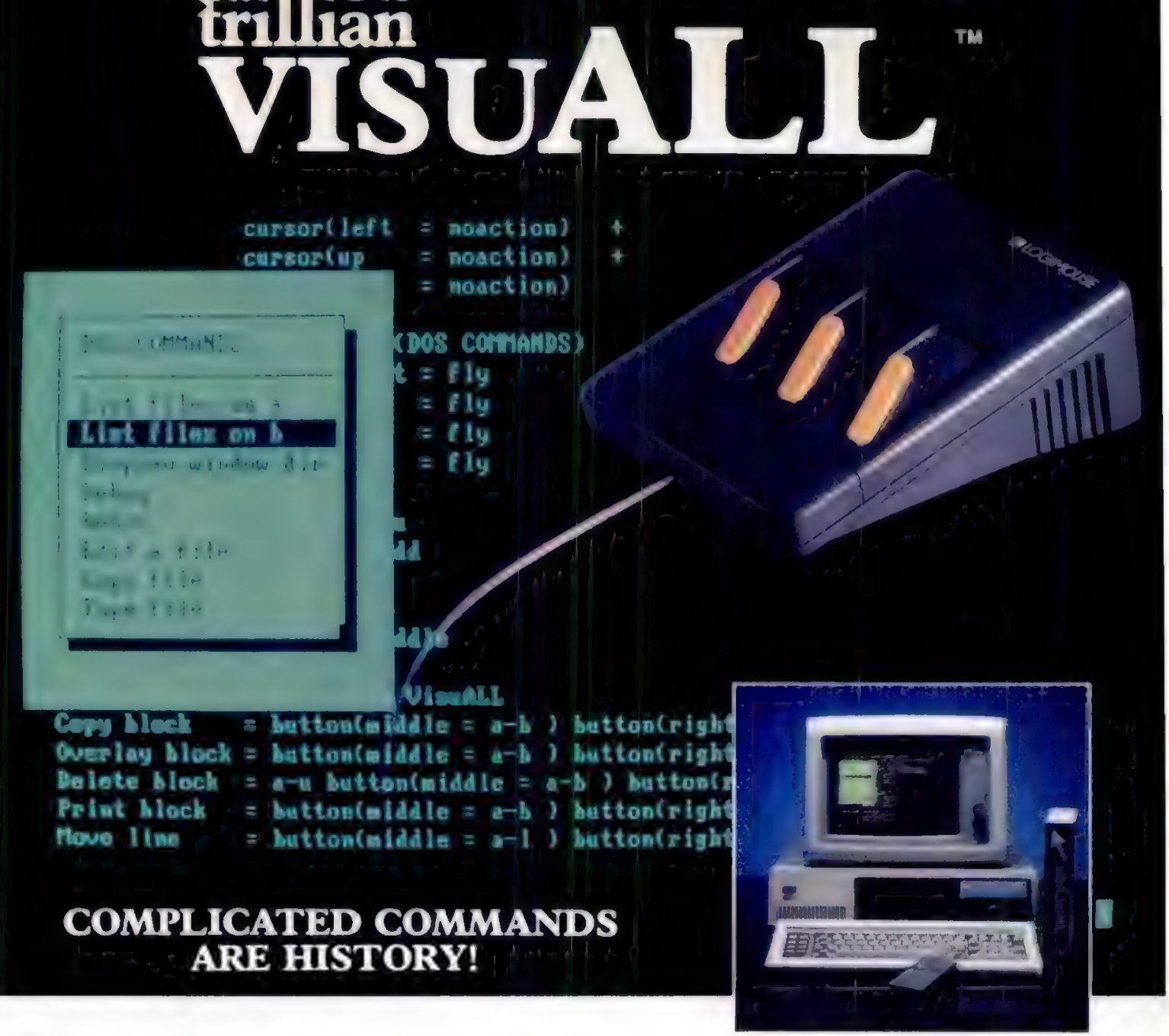
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language. Moore believes that FORTH should carry a certain commonality from machine to machine. This philosophy makes excellent sense, particularly if your dedication is to the language, rather than to the system on which it runs.

FORTH Level 2 does not run under PC-DOS. It doesn't even use the BIOS ROM routine for I/O. These decisions were made so that this version would look and run a lot like FORTH on any other machine. The obvious drawback is that it forces users either to give up a lot of DOS features to which they may have become accustomed or to write their own FORTH words for them. This is the cheetah in the jungle approach. The opportunity for the power is there. If you need it, create the words. If you don't need it, don't waste your time.

A few concessions were made in the Level 2 implementation. In addition to the standard FORTH editor, which is acceptable once you learn to use it, Level 2 contains a good full-screen editor driven by the function keys. Also, 8087 floating-point math and graphics support are offered as options.

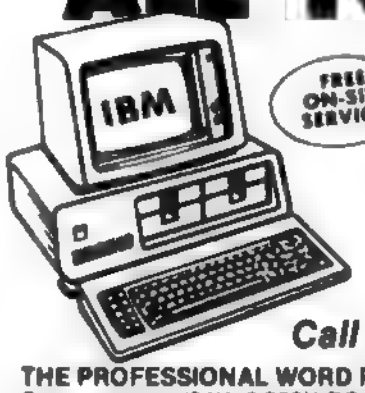
An assembler is included as part of the standard package, for programming time-critical applications. Unfortunately, for those who have already suffered through learning the IBM MACRO Assembler register names and op code mnemonics, the FORTH assembler uses different names and mnemonics and offers only a reduced set. Multitasking, the ability to operate more than one concurrent task, and DOS file handling facilities also come with the system.

A most-important reference work, especially for a beginner, is the book, *Starting Forth*, by Leo Brody. It is written with such wit and charm that I sometimes found myself thinking I understood more than I really did. The book is designed for the reader who knows nothing about FORTH and takes him from the simplest to the most advanced concepts. Still, it is only a book and is no substitute for a course in the language or even the availability of a knowledgeable friend.

Without any help, learning FORTH is not easy, but it can be done. As you progress through the FORTH series of puzzles, you may have an experience like this: You've spent hours trying to write a word for a particular application. After trying many variations, some of which work, some of which don't, you still aren't convinced that any of them will do exactly what you want.

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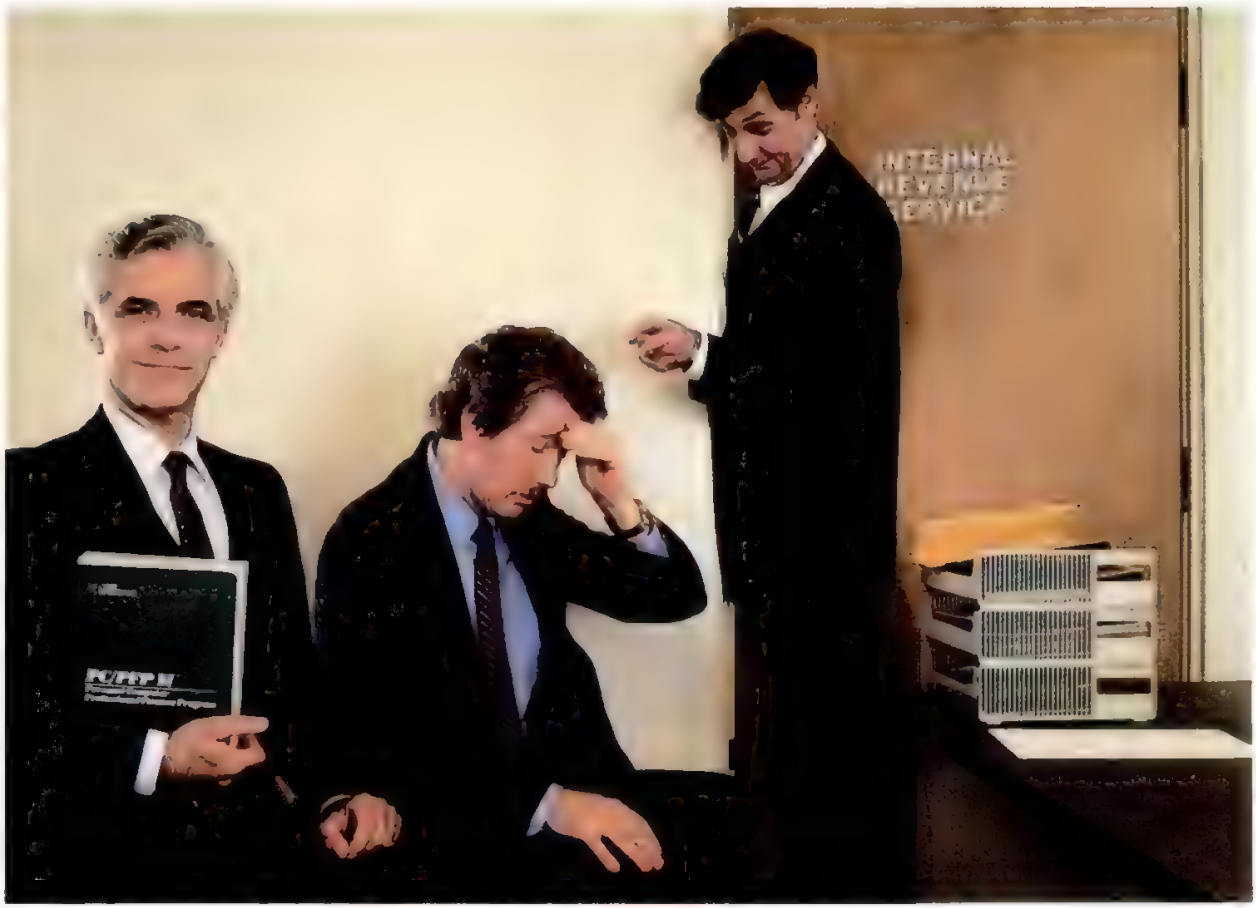
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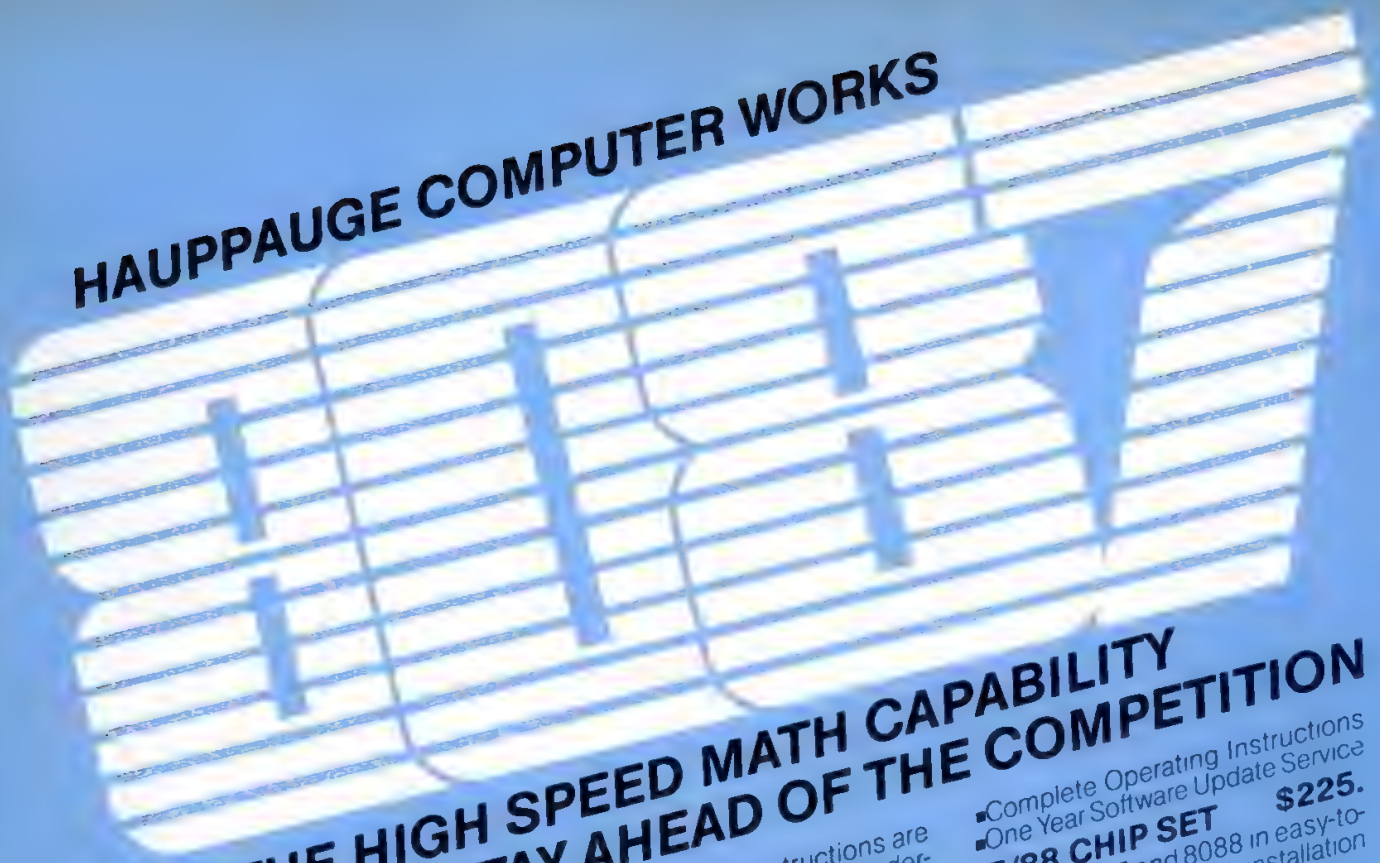
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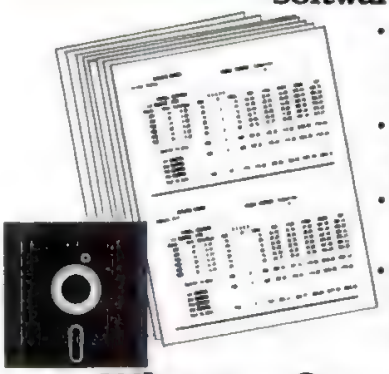
faster than BASIC programs. The reason for this is that each line of assembly language corresponds to a single instruction that can be directly executed by the computer in about a microsecond (one millionth of a second). By contrast, each line of a BASIC program must be translated into assembly language by another program called the BASIC interpreter. (For the moment we speak as if assembly language and machine language are identical. The distinctions between the two are discussed later.) This translation is done as the BASIC program is being run, and it typically takes thousands of microseconds to execute each line of BASIC. Although a line of BASIC typically does a lot more than a line of assembly code, the time required for the translation, and the somewhat inefficient code that is produced, results in very slow execution speeds. Of course, there are other high level languages, such as FORTRAN, which have the translation done before the program is run, and thus execute much more rapidly (these are called compiled languages). However, no high-level language gives you full control over the machine, or the fundamental knowledge of what's happening while the program is running.

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ply design. This is analogous to giving the computer a BASIC program. Both methods would (hopefully) produce a power supply. The second method would be easier and quicker for me to write up, but it would take the shop longer to complete the task of building the supply. Most importantly, with the second method I wouldn't know exactly what was inside the power supply, since the shop designed it, not me. With the first method I would know. The same is true for assembly language compared to a high level language. Working with assembly language gives the benefit of knowing exactly what the computer is doing. When you use a high level language, you only know what results are produced, not how they are obtained. This lack of knowledge may prevent you from exterminating various software/hardware bugs.

In addition to letting you know exactly what's going on when a program is run, assembly language also gives you considerably more power over the computer than you have using BASIC. When an assembly language program is executed (run), it literally takes over complete control of the machine. An assembly program can direct the computer to do absolutely anything that is within the physical capability of the machine's hardware. With BASIC, the BASIC interpreter program always retains ultimate control, and attempts to keep the user from doing anything it considers unreasonable. Of course, the added power of assembly language also has its dangers. It's all too easy to have an assembly language program failure that erases both the program itself and the operating system from memory! There's nothing much you can do after such a program "crash" other than to turn off the computer, and, after you've calmed down and stopped swearing, to turn it back on again and start over. While this kind of problem is very rare with BASIC, it's an all too common occurrence with assembly language. Nonetheless, the power of assembly language is very useful. You can easily write programs that directly control all kinds of I/O (input/output) devices, and arrange to have these control programs left in memory even after the assembly program has finished and you've gone on to something else. This kind of thing simply can't be done with BASIC.

IT'S ALL too easy to have an assembly language program failure that erases both the program itself and the operating system from memory!

Bits, Bytes, Hex, and All That Jazz

In order to understand how a computer operates, we first need to master some terminology and concepts regarding numbers and how they are represented within the computer. Inside the Central Processing Unit (CPU), which is the "brain" of the computer, numbers are held and processed in "registers." A register is just a set of flip-flops (usually 8 or 16 of them) whose contents are read or written simultaneously as a single group. A flip-flop is an electronic device that can store one of two voltage levels: either a low voltage (typically about ø.5 volts) that the computer regards as being a "ø", or a high voltage (typically about 3 volts) that the computer regards as being a "1". Thus, a register can store a group of eight øs and 1s if it's made of eight flip-flops, and a group of 16 øs and 1s if it's made of 16 flip-flops. Each of the øs or 1s is called a "bit" (the word is a contraction of "binary digit"). A group of 16 bits is called a "word" on a 16-bit computer like the IBM PC. A group of 8 bits, or half a word, is called a "byte" on all computers. (The originator of this term must have been hungry when he coined it! Logically enough, a group of 4 bits is called a "nibble.") A group of bits taken together form a binary number, just as the group of digits, 6, 7, and 8, taken together form an ordinary decimal number, 678.

The CPU inside the IBM PC is made by Intel, and is called an 8ø88. It contains both registers that are one byte wide (8 bits) and registers that are one word wide (16 bits). For example, the 8ø88 contains a 16-bit register called the AX register. It consists of 16 flip-flops and thus can hold a 16-digit binary number, i.e. any one of the 65,536 binary numbers between øøø øøøøøøøøøøøøøø and 1111111111111111.

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If this confuses you, recall that with ordinary decimal numbers, the position of each digit in the number is significant. In the number 179, the 9 represents nine ones, the 7 represents seven tens, and the 1 represents one hundred. Thus, starting from the rightmost digit in the number, the value of each digit position increases by a factor of 10 as we go to the left. The same thing is true for binary numbers, except that the value of each digit increases by a factor of 2 as we go to the left. Thus the number 179 in decimal would be 1ø11øø11 in binary (one 1, one 2, zero 4s, zero 8s, one 16, one 32, zero 64s, and one 128). Counting in binary goes like this: ø, 1, 1ø,11, 1øø, 1ø1, 11ø, 111, 1øøø, etc. To get a feel for binary numbers, try a few conversions back and forth between decimal and binary. The numbers 24, 63, and 1øø in decimal should be 11øøø, 111111, and 11øø1øø in binary.

Occasionally we need to pick out specific bits in a register, and to do this we need some way to name each bit. The standard convention is to number each bit starting from the right with bit ø. Figure 1 illustrates this. For an 8-bit register, bit 7 is called the high order or most significant bit (it's the 2^7=128 position). Bit 15 is the high order bit for a 16-bit register. Bit ø is the low order or least significant bit for both 8- and 16-bit registers.

YOU CAN arrange to have control programs left in memory even after the assembly program has finished.

Computer memory is like a set of thousands of registers, except that they're physically located outside the CPU. In the IBM PC, the memory is organized in bytes, i.e., each memory location is a set of 8 flip-flops. As a result, each individual memory location can hold any of the 256 binary numbers between øøøøøøøø and 11111111. The amount of memory one has is usually given in kilobytes (often written Kbytes or just K), and one Kbyte is 1ø24 memory locations. Thus, if someone says he

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has 64K of memory, that means he has 64*1Ø24=65,536 memory locations.

From this discussion, it might seem that only positive integers can be contained or manipulated in registers or memory. This is not the case, however. With the appropriate conventions, any kind of number can be represented in computer memory and in the registers.

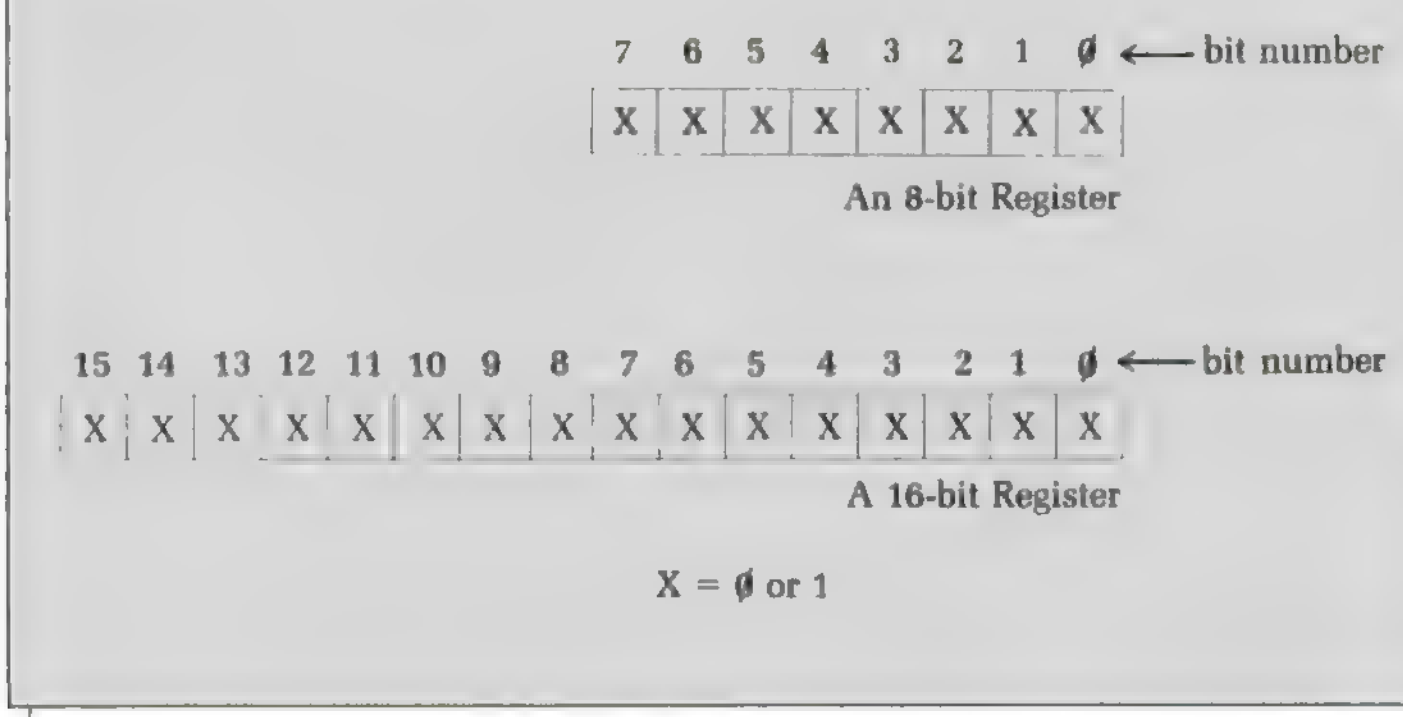
A GROUP of 16 bits is called a "word" on a 16-bit computer like the IBM PC.

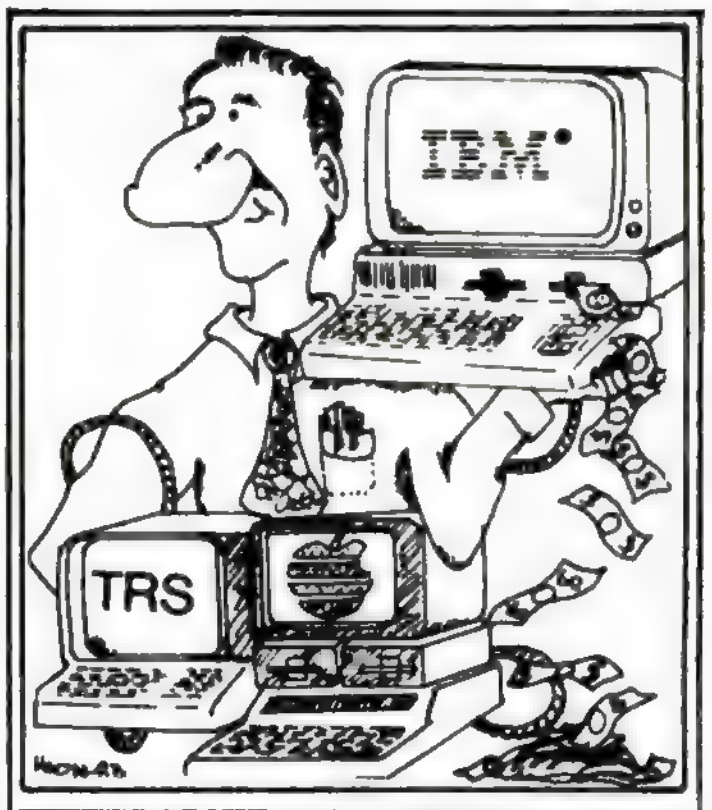
The most commonly encountered need is to represent negative integers. This is done using what is called "two's complement notation." The two's complement of a binary number is defined as the number obtained by changing all the 1s in the number to Øs, all the Øs to 1s, and then adding 1 to the result. Hence the two's complement of Ø11 is 1Ø1, and of 1ØØ11ØØØ is Ø11Ø1ØØØ. It may be tempting to regard this convention as just another plot to confuse beginners, but it's really not. It turns out to be the simplest way to allow for proper addition and subtraction of both positive and negative numbers.

Let's see how it works. For convenience, let's suppose we have just a 4-bit register (we're using one of those cheap 99-cent computer chips). The first requirement is that zero and minus zero ought to be the same number. The two's complement of ØØØØ is 1111+1=ØØØØ! Notice that when there's a carry out of the high order bit it's just lost because the register only holds 4 bits. It's this feature that allows everything to work properly. The two's complement of ØØ Ø1 is 1111, so 1111 is minus 1. Similarly, the two's complement of ØØ1Ø is 111Ø which is minus 2. If there's any justice here, two plus minus two should be zero. Let's try. ØØ10+111Ø=ØØØØ plus a carry out of the high order bit (which is ignored). It works! Also, two plus minus one is ØØ1Ø+1111=ØØØ1 as it should be. In fact, the two's complement convention gives proper arithmetic results for all positive and negative integers. It also works for any size register, be it nibble, byte, or word. Try a few 4-bit examples for yourself. Note that the negative numbers start with 1111(−1) and go to 1ØØØ (−8). They all have in common the fact that their high order bit is 1.

The price one pays for allowing signed binary numbers in two's complement form is a reduction in the range of allowable positive integers. With an 8 bit register, an unsigned binary number can be in the range Ø to 11111111 (255 decimal). A signed binary number, however, cannot be bigger than Ø1111111

Figure 1: Naming the bits in 8- and 16-bit registers.





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(127 decimal) because the next higher number is 1ØØØØØØØ, and all signed binary numbers whose high order bit is one are negative by convention. 1ØØØØ ØØØ is −128 decimal. Similarly, signed 16-bit binary numbers are restricted to the range +32,767 to −32,768.

As can be seen from the examples above, it's awkward for us humans to write out binary numbers, and even more awkward to do arithmetic with them. Unfortunately, it's also awkward to try to describe computer operations using only decimal numbers. The main problem is that a lot of important information about a binary number is lost when it is written in decimal. For example, does the binary equivalent of 32,76Ø have all zeros in its low byte (the rightmost 8 bits)? Do the binary equivalents of 87 and 91 differ in only 1 bit position? These questions can only be answered by converting from decimal to binary, which, as you've no doubt noticed, is slow and tedious.

Fortunately, there is another number

IT'S AWKWARD to write out binary numbers.

system that is easier than binary, retains much of the structure of binary numbers, and is very easy to convert to binary and back. This is the hexadecimal (base 16) number system. In decimal, we have 1Ø unique digit symbols, Ø thru 9. In hexadecimal we need 16 unique symbols. The standard convention is to use Ø thru 9 plus the first six letters of the alphabet, A thru F. Thus, one counts Ø, 1, 2, ..., 8, 9, A, B, C, D, E, F, 1Ø, 11, ..., 1F, 2Ø, ... The use of letters to represent numbers causes a few problems, but this is the standard notation.

Conversion between binary and hex is very easy. It relies on the fact that there are exactly 16 four-bit binary numbers, ØØØØ through 1111. Thus, any group of 4 bits converts to exactly one hex digit. To convert any arbitrary binary number to hex, divide it up into groups of 4 bits starting from the right. If the number of bits isn't a multiple of 4, just add zeros on the left of the binary number until it is. The conversion of each group of 4 bits can then be done by inspection. We strongly recommend learning the hex names of the 16 combinations of 4 bits. To get going, just remember that the leftmost bit in the group has a value of 8, the next has a value of 4, the next a value of 2, and the rightmost bit a value of 1. For example, 1Ø11 is 8+2+1=B. By the same process, a hex number can easily be converted to binary, digit by digit. To convert the hex number D (which is 13 in decimal), we just note that it can be written as 8+4+1 which is 11Ø1 in binary.

We use hex extensively throughout the rest of this book. One potential confusion that can arise is whether a number such as 17 is decimal or hexadecimal. In such cases we write an "H" behind the number to indicate that it's hex; i.e., we write 17 hexadecimal as 17H. Another cause of confusion is whether CH is a number or a register. So, we start all numbers with a decimal digit. Instead of CH, we write ØCH.

Doing arithmetic in hex takes a bit of time to learn. Fortunately, one usually only needs addition and subtraction, and these are fairly easily mastered. If you don't want to make the effort, you can always use the "H" command of the IBM DEBUG program. This calculates the sum and difference of any two hex numbers for you. You'll also find it useful to be able to count backwards in hex so that you can count with signed binary numbers. For example, ØFF, ØFE, and ØFD are the hex equivalents of the 8-bit signed binary numbers −1, −2, −3.

There are always occasions where you need to convert from hex to decimal and vice versa. There is no really easy way to do this (unless you write a little computer program to do it or have a programmer's calculator). A hex to decimal conversion table is a very useful aid. There are a couple of conversions that are worth memorizing, namely that 1Ø ØH is 256 decimal, 1ØØØH is 4Ø96 decimal (often referred to as 4K), and

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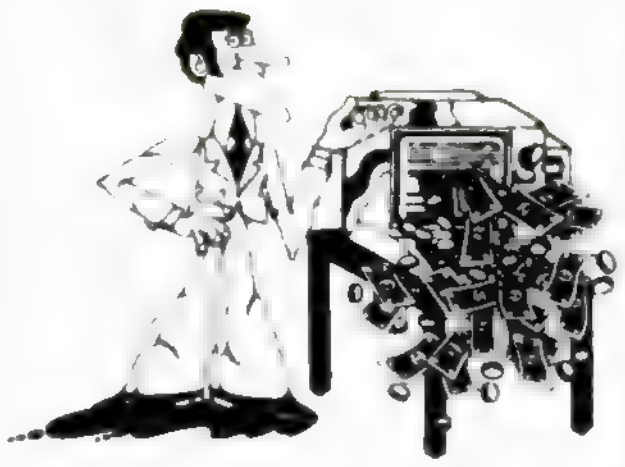
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10000H is 65,536 decimal (64K).

If this discussion still all sounds like Greek to you, you may want to consult Adam Osborne's book, *Introduction To Microcomputers, Vol. 0* (Osborne/McGraw-Hill). Extensive discussions of number systems and binary arithmetic are given at a very elementary level.

How Numbers and Letters Are Stored in a Computer

We've just seen how positive integer numbers can be stored in the computer as binary numbers, and how both positive and negative integers can be stored as signed binary numbers using two's complement notation. At this point you might

Hex and Decimal Values for ASCII Characters

Refer to this table to find the hexadecimal values used for ASCII characters in assembly language programs. The first 32 ASCII characters are called control characters because they are produced on the IBM PC by holding down the Ctrl key while pressing another key.

			hex	dec
NULL	Null	Ctrl-@	0	0
SOH	Start of Heading	Ctrl-A	1	1
STX	Start of Text	Ctrl-B	2	2
ETX	End of Text	Ctrl-C	3	3
EOT	End of Transmit	Ctrl-D	4	4
ENQ	Enquiry	Ctrl-E	5	5
ACK	Acknowledge	Ctrl-F	6	6
BEL	Bell	Ctrl-G	7	7
BS	Back Space	Ctrl-H	8	8
HT	Horizontal Tab	Ctrl-I	9	9
LF	LineFeed	Ctrl-J	0A	10
VT	Vertical Tab	Ctrl-K	0B	11
FF	FormFeed	Ctrl-L	0C	12
CR	Carriage Return	Ctrl-M	0D	13
SO	Shift Out	Ctrl-N	0E	14
SI	Shift In	Ctrl-O	0F	15
DLE	Data Line Escape	Ctrl-P	10	16
DC1	Device Control 1	Ctrl-Q	11	17
DC2	Device Control 2	Ctrl-R	12	18
DC3	Device Control 3	Ctrl-S	13	19
DC4	Device Control 4	Ctrl-T	14	20
NAK	Negative Acknowledge	Ctrl-U	15	21
SYN	Synchronous idle	Ctrl-V	16	22
ETB	End of Transmit Block	Ctrl-W	17	23
CAN	Cancel	Ctrl-X	18	24
EM	End of Medium	Ctrl-Y	19	25
SUB	Substitute	Ctrl-Z	1A	26
ESC	Escape	Ctrl-[	1B	27
FS	File Separator	Ctrl-\	1C	28
GS	Group Separator	Ctrl-]	1D	29
RS	Record Separator	Ctrl-^	1E	30
US	Unit Separator	Ctrl-_	1F	31

	hex	dec		hex	dec		hex	dec
SP	20	32	@	40	64	`	60	96
!	21	33	A	41	65	a	61	97
"	22	34	B	42	66	b	62	98
#	23	35	C	43	67	c	63	99
$	24	36	D	44	68	d	64	100
%	25	37	E	45	69	e	65	101
&	26	38	F	46	70	f	66	102
'	27	39	G	47	71	g	67	103
(	28	40	H	48	72	h	68	104
)	29	41	I	49	73	i	69	105
*	2A	42	J	4A	74	j	6A	106
+	2B	43	K	4B	75	k	6B	107
,	2C	44	L	4C	76	l	6C	108
-	2D	45	M	4D	77	m	6D	109
.	2E	46	N	4E	78	n	6E	110
/	2F	47	O	4F	79	o	6F	111
0	30	48	P	50	80	p	70	112
1	31	49	Q	51	81	q	71	113
2	32	50	R	52	82	r	72	114
3	33	51	S	53	83	s	73	115
4	34	52	T	54	84	t	74	116
5	35	53	U	55	85	u	75	117
6	36	54	V	56	86	v	76	118
7	37	55	W	57	87	w	77	119
8	38	56	X	58	88	x	78	120
9	39	57	Y	59	89	y	79	121
:	3A	58	Z	5A	90	z	7A	122
;	3B	59	[	5B	91	{	7B	123
<	3C	60	\	5C	92	|	7C	124
=	3D	61	]	5D	93	}	7D	125
>	3E	62	^	5E	94	~	7E	126
?	3F	63	_	5F	95	Del	7F	127

be wondering how the computer knows whether the number ØFE in an 8-bit register is the unsigned number 254 decimal or the signed number −2. The answer is that the computer doesn't know and doesn't care! The computer just operates as it's told to on binary numbers. How they are interpreted and what operations are done is up to you, the programmer. Hence we can interpret the binary numbers in the computer in any way that we wish. All that's required is that the operations we do on them be appropriate for the interpretion we give to them.

In light of this, it shouldn't be surprising that there are other ways of using binary numbers to represent numerical quantities and even letters. Let's look quickly at three widely used representations: ASCII code for numbers and letters, BCD numbers, and floating point numbers.

ASCII is the acronym for American Standard Code for Information Interchange. In ASCII, the letters of the alphabet (both capital letters and lower case), the decimal digits Ø–9, and various punctuation symbols, are each assigned a unique 7-bit binary number. (The complete set of codes used by the IBM PC is given in Appendix G of IBM's BASIC manual.) Since computer memory only handles 8-bit quantities, an extra bit set to Ø is added as the high order bit when ASCII is stored in the computer. Thus if you want to store the string of letters "THIS IS TEXT" in computer memory, you store the sequence of hex numbers "54 48 49 53 2Ø 49 53 2Ø 54 45 58 54" in memory. Thus

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text is stored in computer memory using one byte of memory per letter. Similarly, the decimal number 689 would be stored in memory as three bytes, "36H 38H 39H" using ASCII. If you look at the ASCII table, you will also notice that the ASCII codes ø through 1FH are assigned as control codes. The computer uses these codes to tell I/O devices like printers or display screens to do operations like "start a new page."

In the PC there is also an additional set of 128 "extended" ASCII codes which are used to represent a variety of other symbols like foreign alphabets. These extended codes are not part of the ASCII standard. The definitions of these extended ASCII codes can be found in Appendix C of the IBM *Technical Reference Manual*.

Another way of representing numbers in a computer is to use BCD, which is short for Binary Coded Decimal. In BCD, one uses 4 bits to represent each decimal digit ø–9, with ø=øøøø, 1=øøø1, ..., and 9=1øø1. The remaining 4-bit codes 1ø1ø through 1111 (corresponding to hex digits A thru F) have no meaning and are not allowed. In the computer we pack two BCD digits into each byte. Thus the decimal number 689 would be stored in memory as two bytes, ø6 89, using BCD.

THE EXACT format used for floating point numbers varies from one computer to another and sometimes even from one computer language to another!

The most flexible number representation of all is to store numbers as "floating point numbers." This method allows the computer to handle both very large and very small numbers, and is based on so-called "scientific notation" that is commonly used by scientists and engineers. The idea is to represent a number as a product of a mantissa and an exponent. For example, to represent the decimal number 1,749,øøø we write 1.749×10^6. To represent the decimal number ø.øø øø314 we write 3.14×10^{-5}. The mantissa is a number between 1 and 1ø, and gives the significant digits in the number, and the exponent tells us where to place the decimal point. In the first example above, the mantissa is 1.749 and the exponent is 6, which tells us that we should move the decimal point in 1.749 six places to the right to obtain the number in its ordinary form.

The same thing can be done with binary numbers. Any binary number can be written in the form $(+/-)1.BBBBBB \times 2^{(+/-)EE}$, where the Bs and Es are 1s or øs. In a single precision floating point number, 24 bits are used for the mantissa including one bit for

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the sign, and 8 bits (including a sign) are used for the exponent. This allows numbers between 10^{38} and 10^{-38} to be represented with about 6 to 8 decimal digits of accuracy. If more range or accuracy is needed, a double precision floating point number can be used which allocates 53 bits for the mantissa and 11 bits for the exponent, giving a range of 10^{308} to 10^{-308} and an accuracy of about 13 to 16 decimal digits. Unfortunately, the exact format used for floating point numbers varies from one computer to another and sometimes even from one computer language to another! There is now a proposed IEEE floating point standard, however; in the near future most software should conform to it.

We've just seen that there are a variety of ways to represent a given number in the computer. Which method is used depends on the situation. If you must be able to handle the largest range of number values, floating point numbers are the only reasonable choice. However, it is very difficult to write assembly language programs that handle floating point numbers properly. The 8087 numeric data processor chip takes much of the burden off the programmer, and standard packages of floating point subroutines are available, but in general, you are much better off using a high level language like BASIC or Pascal if you need to handle floating point numbers in a given application. You can always combine high level language programs with assembly language subroutines to get the best of both worlds.

THERE IS no visible distinction between a program stored in memory and data stored in memory.

ASCII is nearly always used for text, but only rarely for numbers if any arithmetic has to be done with them. The 8088 CPU in the IBM PC has several special instructions that facilitate doing arithmetic with ASCII numbers, but it's still fairly complex to do.

The BCD representation is often used in business applications since it provides a relatively easy way to do exact arithmetic with very large integers. Since such numbers often represent dollars, you don't want to have round-off errors and you also want to be able to handle amounts larger than $65,535! The 8087 numeric data processor can do arithmetic with BCD numbers of up to 20 digits.

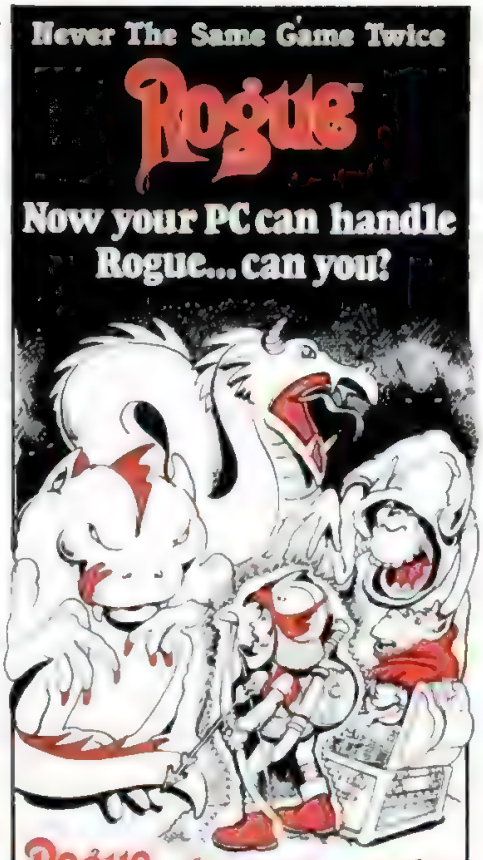
For handling input and output from I/O devices, however, signed or unsigned binary integers are by far the most convenient. Binary arithmetic is relatively simple and straightforward, and the computer's instruction set is optimized to handle binary arithmetic. Numbers typically enter and leave the computer through I/O devices as ASCII, but we can immediately convert them into binary, operate on the binary numbers, and then convert them back to ASCII before outputting them.

A Paper and Pencil Computer

We're now ready to start building a "mental model" of how a computer works. A good way to start is to consider a sort of paper and pencil computer that you can use to help visualize what goes on inside the computer. The two most essential parts of a computer are a central processor unit (CPU) and memory. The CPU contains a set of registers that can do arithmetic and logical operations (setting bits to 0 or 1, shifting them right or left, etc.) on numbers contained in them. Memory is like a whole set of registers, with each memory location having its own unique address.

Our paper and pencil model for memory is a set of mailboxes or pigeon-holes. Each mailbox is distinguished from all others by its address, which we can imagine to be a number written on the outside of each box. The mailboxes are numbered sequentially, 0, 1, 2, . . ., so that we can easily find any mailbox in the set. Each mailbox can contain a single number inside it, which we imagine to be written on a slip of paper and placed in the box.

The CPU consists of a person at a desk in front of the mailboxes. On the desk are small boxes that represent the CPU's internal registers. Each one can contain a number written on a slip of paper just like the memory mailboxes. We suppose that there are just two registers, labeled AL and IP



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Figure 2: A do-it-yourself paper and pencil computer.



respectively. AL is an 8-bit register, while IP is a 16-bit register. The control circuitry for the CPU is represented by the person, who has a pencil and a pad of small slips of paper. He also has a small book containing a list of all the allowed operations the CPU can perform along with a numeric code for each operation. The human CPU can read what's in any memory address or register by just looking at what's written on the slip of paper inside, and can write a new value in an address or register by writing the desired value on a new slip of paper and replacing the old slip of paper with the new one. Figure 2 illustrates the layout of our paper and pencil computer. As we shall see, the human control unit's job is very simple and repetitious, so here's a situation where a person can (and usually is!) replaced by a machine.

Now let's look at how our "computer" runs a simple program that adds 8 to the number stored in the mailbox whose address is 2ØØ (or, put more succinctly, the number in address 2ØØ). A simple program that does this is

```
MOV   AL,8
ADD   [2ØØ],AL
```

These instructions are essentially written in assembly language; we have to give our mailbox at 2ØØ a formal name when using the IBM Macro Assembler program. We can write the program as shown here with the handy DEBUG program. We can also add 8 to the number in [2ØØ] with a single 5-byte instruction, but the above form has pedagogical advantages.

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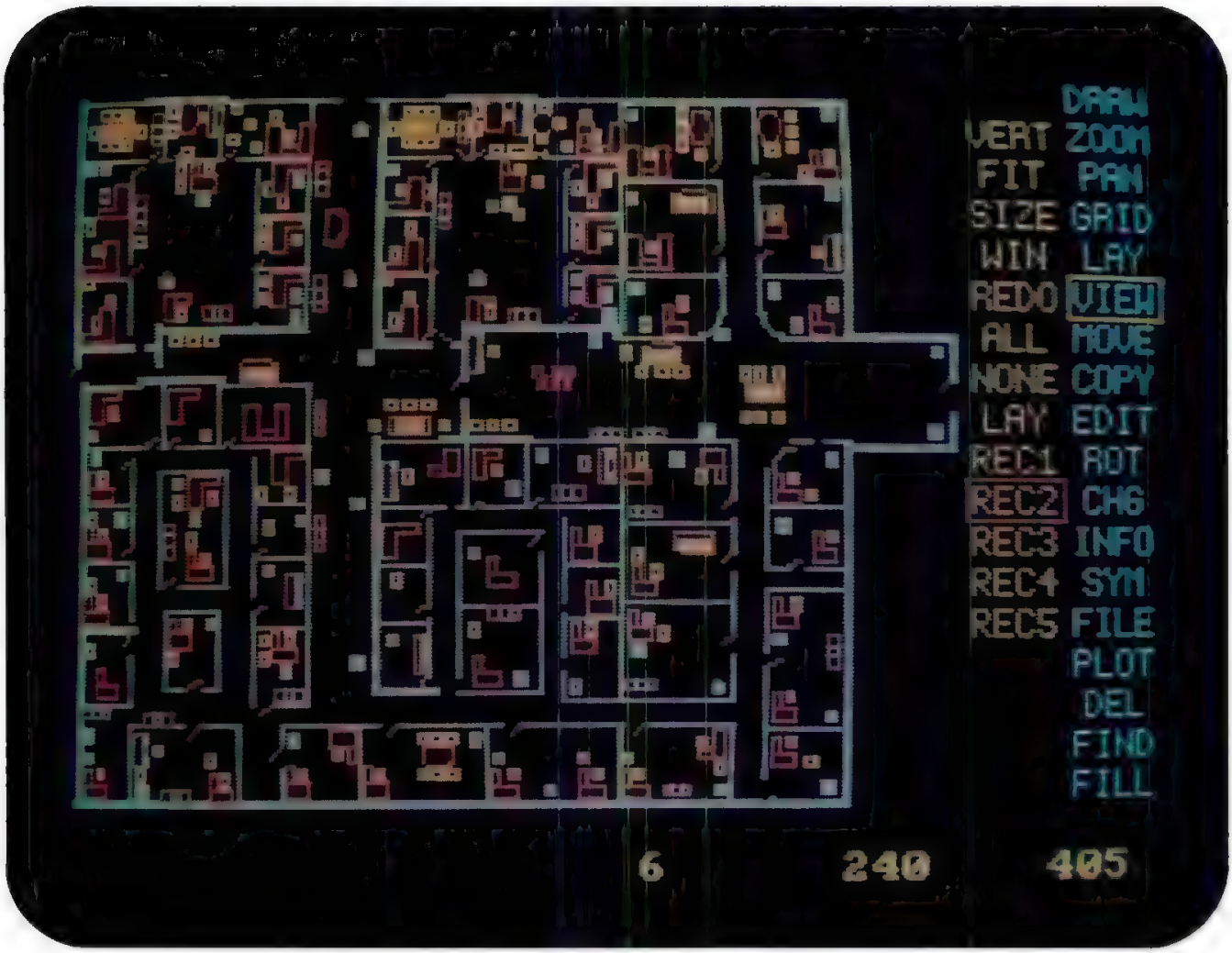


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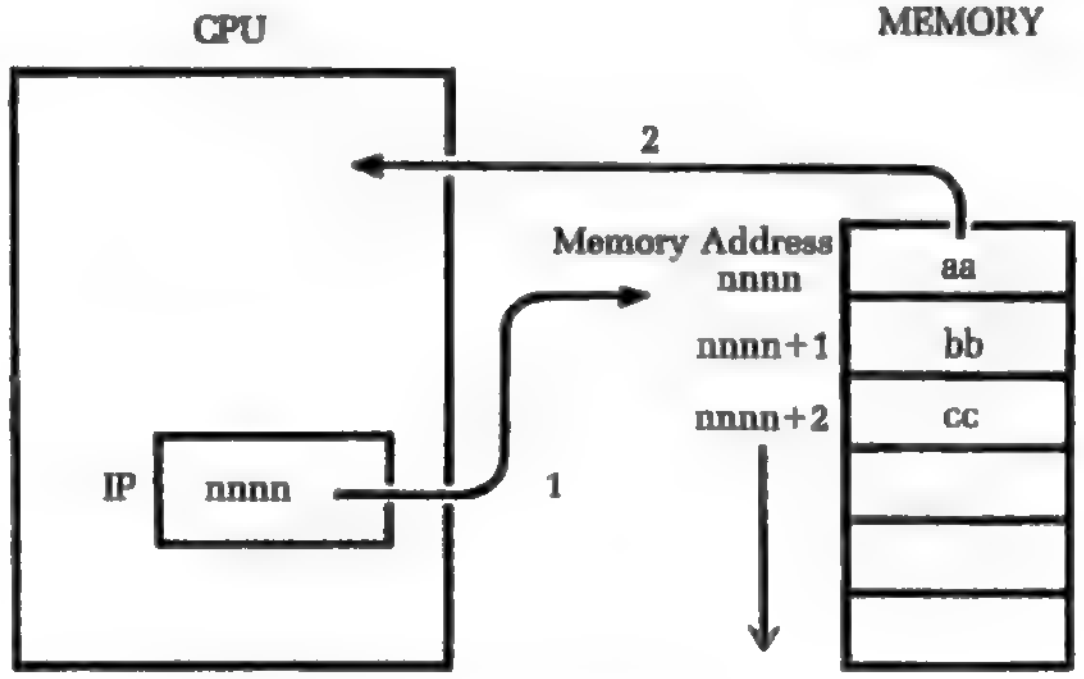
There are several standard conventions for 8Ø88 assembly language being used here. First, the form of the assembly language statements is "action destination, source"; i.e., the action to be performed is given first (e.g., MOV), then the destination where the result is to be placed is written, followed by the source where the data is to be gotten from. The destination and source are separated by a comma. For MOV AL,8, the 8 in the instruction is moved into the AL register. Second, a number in square brackets means that you should interpret what's inside the brackets as a memory address, and use the contents of that address as the source or destination data. Hence ADD [2ØØ],AL adds the contents of AL to the contents of location 2ØØ.

Now let's look at how the computer runs a program like the one above. The first question that comes up is: Where does the program go, and in what form? We haven't provided any special place in the computer to store programs, and even if we had, the computer isn't able to read English. The solution is ingeniously simple. We represent each instruction by one or more numbers. These numbers serve as codes for the instructions. The encoded program is then just a string of numbers which is stored in the memory mailboxes. Note that the program is stored in the same memory as the data you want the program to manipulate. There is no visible distinction between a program stored in memory and data stored in memory (though we normally store the two at separated addresses). When encoded as numbers, our little example program looks like:

```
BØ Ø8
ØØ Ø6 ØØ Ø2
```

The number corresponding to an instruction is called the "op code" for that instruction. Here (and throughout the rest of this section) all numbers are hexadecimal. The binary equivalents of these hex numbers are stored in order in a sequential set of mailboxes. If the program is stored starting at address Ø, for example, address Ø would contain the number BØ, address 1 would contain Ø8, address 2 would contain ØØ, address 3 would con-

Figure 3: An instruction fetch cycle.



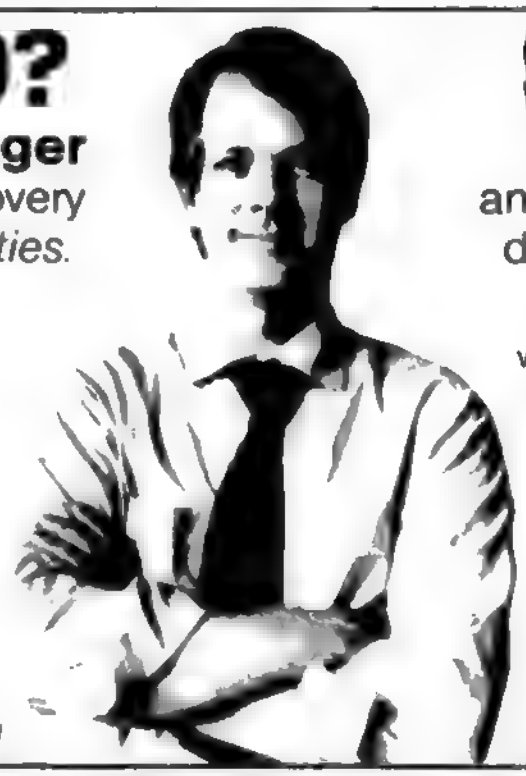
1. The CPU selects a memory address nnnn to read by using the contents of the IP register.
2. The contents of memory address nnnn (i.e., "aa") are then read by the CPU.
3. The IP register is incremented to nnnn+1.

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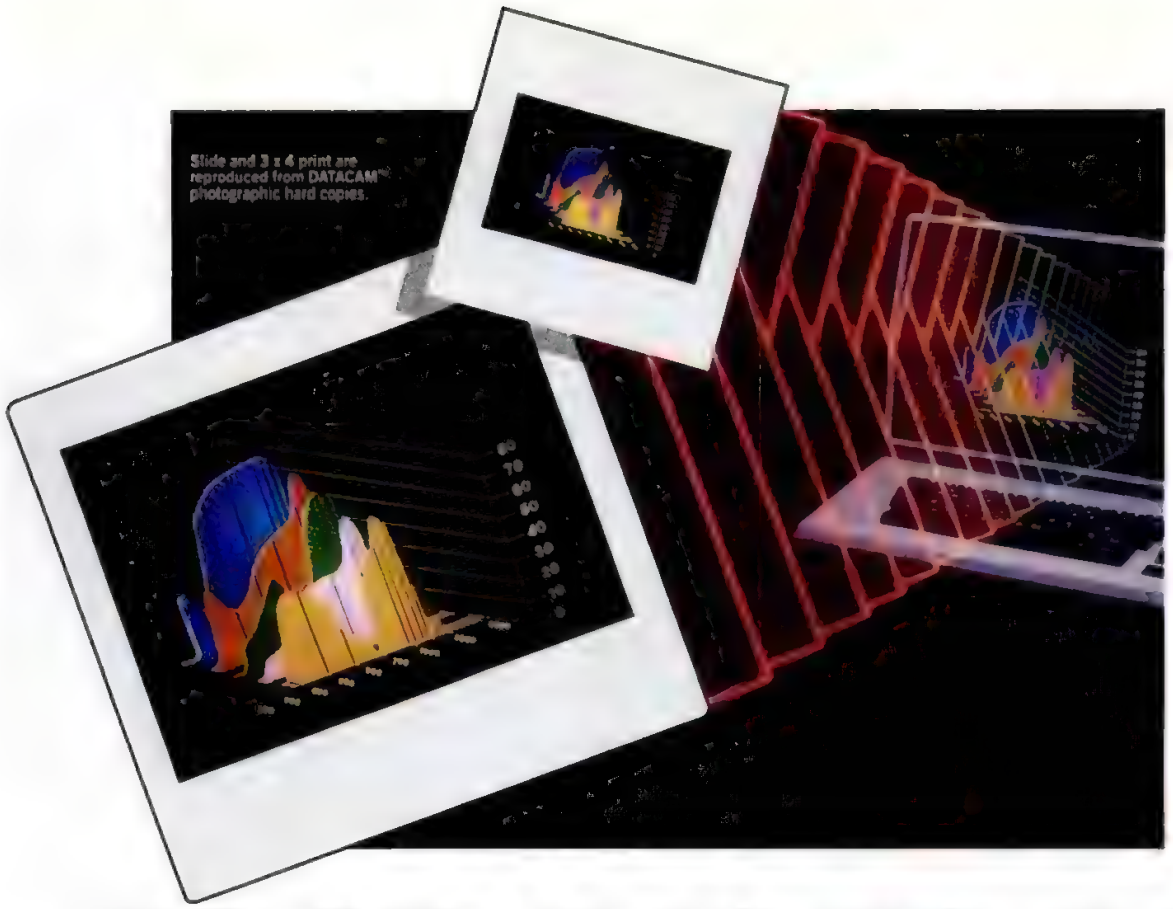
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tain ø6, address 4 would contain øø, and address 5 would contain ø2.

To execute (run) this program, the CPU must somehow have the address of the first instruction placed in the IP register. We will discuss how this can be done shortly. For the moment, let's just assume that the program starts at address ø and that the IP register contains ø also. We can now start up our paper and pencil computer.

Execution begins with the CPU fetching (reading) the contents of the address the IP is pointing to, i.e. it looks at the number contained in the IP (which is ø here), and then looks in the mailbox whose address is this number (mailboxø).

MAKE sure you distinguish between an address and the contents of that address.

Inside mailbox ø it finds a Bø, which it reads (imagine that it gets copied onto a sheet of scratch paper). As soon as it reads the Bø, it immediately increments the IP, i.e., it adds 1 to IP. The process just described is called an "instruction fetch cycle." The contents of IP are assumed to contain a memory address, the contents of this address are read by the CPU, and the IP is incremented. Figure 3 illustrates what happens in an instruction fetch cycle. This cycle is repeated every time that the computer executes an instruction, so it's very important that you understand what happens. Make sure you distinguish between an address and the contents of that address, and between a register and the contents of that register.

Having fetched the first byte of an instruction, the CPU is now ready to execute it. To do this, it checks a little internal table to see what the instruction requires it to do. In our paper and pencil model this corresponds to looking in the small op code book we had sitting on the desk. In our example program, the instruction fetched was a Bø. The internal table tells the CPU that Bø means to move an 8-bit value into AL, and that this value is contained in the next byte of the program. Fetching the contents of address 1 (which is a ø8), the CPU moves the value 8 into AL. It is then ready to fetch, decode, and execute the second instruction of our program. Fetching the op code øø from address 2, the CPU knows it has to add a byte value in a register to some memory location. To find out which register and memory location to use, it fetches the next program byte (at address 3), which is a ø6. This byte tells it that the contents of AL must be added to the memory location specified by the following two bytes: øø and ø2. These bytes are fetched by the CPU and combined to form the 16-bit address ø2øø. Note that the first address byte read is assumed to be the least significant (rightmost) byte of the word. This convention is always used by the 8ø88 CPU whenever a 16-bit word is stored in memory. It may seem backwards, but it's the way it's done, not only on the 8ø88, but also on many other computers such as the 8ø8ø and the Z8ø.

We've now finished describing the execution of two instructions. Every instruction that the computer executes is done in roughly the same way. The computer always begins by fetching the instruction from memory. It determines what the instruction means, and if required, fetches one or more additional bytes of the program to obtain any further information needed to complete the instruction. Notice that the IP always contains the address of the next byte in the program because it is always incremented immediately after each byte is fetched from memory. Once the instruction fetch cycle and any additional memory reads are complete, the CPU performs an execution cycle in which the operation requested by the instruction is completed. The amazing thing about a real computer is that it takes only about a millionth of a second to do all of this!

At this point you should have a good grasp of how a computer executes a program. If you're still a little unsure, try actually setting up the paper and pencil computer we've described, and execute the program just presented yourself. Later, we will actually enter and follow the execution of simple programs with a special program called DEBUG.

Although we've described in some detail how a computer executes a program, several questions still remain unan-

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swered. First, how does a computer get started; i.e., what happens when the power is first turned on? The answer is that at power-on, the IP is set to a fixed value by internal hardware inside the CPU, and the CPU then starts to execute whatever program is at that address. The program located at that address is usually contained in a special type of memory chip called a ROM, (Read-Only Memory). This program is permanently etched in the chip and cannot be altered or erased except by replacing the chip. In the IBM PC, the 8Ø 88 CPU starts to execute the program in ROM, and this program tells the computer to load in a much more elaborate program from the floppy disk called a Disk Operating System (commonly called a DOS), provided the system has a disk drive attached. The procedure of having a small program load in a much more complicated one is called "bootstrapping" or "booting up the system." The terminology comes from the old phrase, "lifting yourself by your own bootstraps." The DOS program controls the screen and keyboard, and permits other programs to be loaded into memory at your command.

When a program, such as the two-instruction example we have discussed, is stored into memory by the DOS, the DOS keeps track of where it stored it, and then places the beginning address in the IP register. The instruction that places a new value in the IP is called a jump instruction, since the program execution suddenly jumps to a new place in memory when the value in IP is changed. Once the jump instruction is executed, our little program starts to execute.

A second question is: What happens at the end of our program? Does the computer stop operating or what? The answer is that our program is incomplete. If the program were loaded as given, the computer would execute the MOV and ADD instructions. The IP would then be pointing to the next location in memory, and the CPU would fetch whatever was there. But what's in memory there may not be an instruction! It's just some random number that happened to be there when power was turned on, or a number left there by a previous program. The results of having the computer fetch random numbers and interpret them as instructions are often quite bizzare and unpredictable. Typically, all the memory quickly gets garbage written into it (remember the computer executes hundreds of thousands of instructions per second), and the computer stops responding to anything. This is called having the computer "crash."

The way to avoid producing a crash at the end of a program is very simple. We just add a jump instruction after the last instruction of the program. This instruction loads the IP with the address of an entry point (the first instruction of a program or a section of a program) to the DOS. In this way, the computer immediately goes back to running the operating system program as soon as it finishes a user program, such as our example.

Machine Language Versus Assembly Language

One point that needs to be clarified is the relationship between machine language and assembly language. As we've seen, when the computer executes a program, it reads a list of binary numbers in memory, and interprets them as instructions. To make the numbers easier to read, we normally write them in hexadecimal. This list of numbers, whether in binary or hex, is called a machine language program. The hexadecimal listing of the little program discussed in the previous section is an example of machine language.

THE procedure of having a small program load in a much more complicated one is called "bootstrapping" or "booting up the system."

While one can write programs directly in machine language, the process leaves a lot to be desired. After deciding what instructions you want the computer to execute, you have to look up the numeric code for each instruction in a table. The resulting list of hex numbers can then be entered into computer memory and exe-

cuted. If you wish, you can actually try this using the IBM DEBUG program. The "E" command allows you to enter the op codes into memory, and the program can then be executed using the "C" or "T" command. This whole process is slow and tedious since the op codes for each instruction must be calculated using a reference book such as the *iAPX 88 Book* (Intel Corporation). There are about 134 distinct instructions, and most of these can use any one of 24 memory addressing mode variations or any one of 16 different CPU registers for both the source and the destination. Thus, a single instruction can have up to 1,024 variations, and the total number of distinct op codes is many tens of thousands. What's worse, if a mistake is found (and one almost always is) that requires the addition or deletion of instructions in the middle of the program, much of the program has to be reentered into memory, and the codes for some instructions (jumps and calls) have to be recalculated. An equally severe problem is the lack of documentation. A machine language program is virtually unreadable when you go back to look at it even a short time after you've written it. This makes it extremely difficult to modify or improve a previously written program.

Almost all the problems just described can be eliminated by using assembly language instead of machine language. Assembly language is essentially a human readable form of machine language. To illustrate, let's repeat the little program we discussed in the previous section:

```
B0 08          MOV AL,08
00 06 00 02    ADD [200],AL
```

The machine language program is on the left, while the equivalent assembly language program is on the right. The assembly language is clearly far easier to read and understand. Since it's really a shorthand description of the computer operations to be performed, assembly code can be written down directly, without having to look up anything.

An obvious problem with assembly language is that something has to be done to allow the computer to read it. This job is accomplished by having the computer run a special program called an assembler. The assembler reads your assembly language program, and translates each assembly language statement into binary machine language. This process is fairly fast, requiring only seconds for a program of average size. Furthermore, unlike humans, the computer doesn't make mistakes when doing the translation. The IBM Macro Assembler is the standard assembler program available for an IBM PC running PC-DOS.

The IBM DEBUG program that is included on the PC-DOS disk (Versions 2.0 and later) also has a mini-assembler built into it that can be used to enter, run, and save small assembly language programs. Although it is not suitable for developing and documenting substantial assembly language programs, it is much simpler and easier to learn than the IBM Macro Assembler. In the last section we present some short programs that you should try out for yourself using the DEBUG program. This will give you a feel for what assembly language is all about. First, though, let's take a quick look at the registers available in the 8088 CPU, the chip that is the heart of the IBM PC.

The 8088 Register Set

For the purposes of assembly language programming, the 8088 can be looked at as simply a set of registers whose contents can be modified in various ways by the assembly language instructions. Figure 4 shows the complete set of 8088 registers. As can be seen, the 8088 has a total of fourteen 16-bit registers. These registers may be divided into four different functional groups as shown in the figure. Let's take a look at the various registers. As discussed later, many of the registers have special functions when used with certain instructions, although they can also be used as general purpose registers. If you don't understand everything on first reading, don't be alarmed. This is just a brief preview.

The most important group of registers is the data group; these are the most flexible and often used registers. They are unique in that each of the four can be used either as a single 16-bit register or as a pair of 8-bit registers. For example, we could fill the 16-bit AX register with the number 0008 using the MOV AX,8 instruction. The same number could also be put in the register using two instructions:

```
MOV AH,0
MOV AL,8
```


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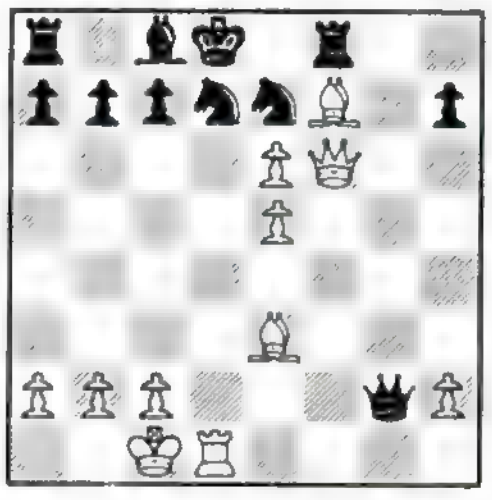
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The data registers behave identically for most instructions, but there are some differences. First of all, many instructions execute faster and/or have a shorter machine language instruction when the AX (or AL) register is used. Also, the AX (or AL) register is used for all input/output instructions. The AX register is often referred to as the accumulator, because in early computers the A register was the only register where arithmetic could be

Figure 4: The 8088 register set.

DATA REGISTERS

AX	AH	AL	"accumulator"
BX	BH	BL	"base"
CX	CH	CL	"count"
DX	DH	DL	"data"

POINTER AND INDEX REGISTERS

SP		"stack pointer"
BP		"base pointer"
SI		"source index"
DI		"destination index"

SEGMENT REGISTERS

CS		"code segment"
DS		"data segment"
SS		"stack segment"
ES		"extra segment"

INSTRUCTION POINTER AND FLAGS

IP																"instruction pointer"
FLAGS					O F	D F	I F	T F	S F	Z F		A F		P F		C F	"flags"
	15				11	10	9	8	7	6	5	4	3	2	1	0	



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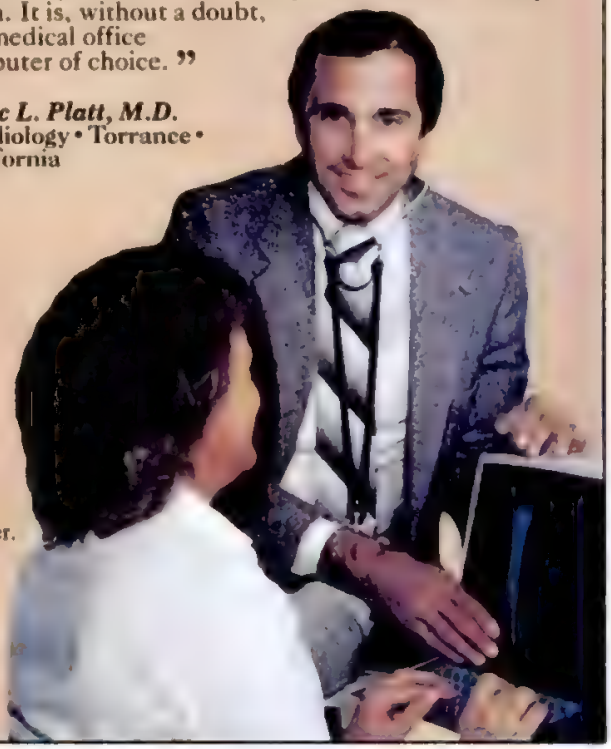
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Figure 5: *How memory addresses are formed by the 8088.*

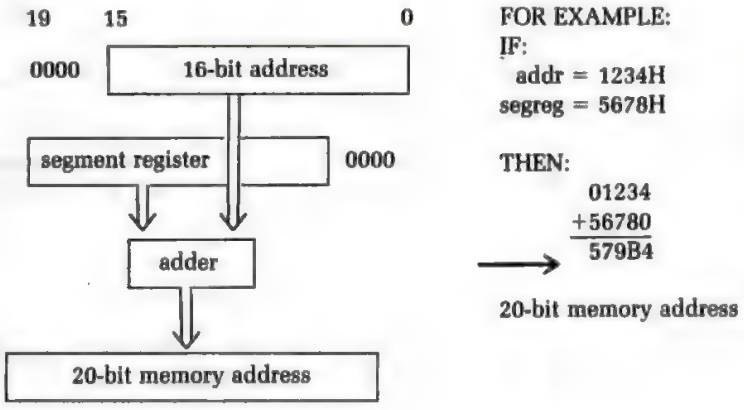
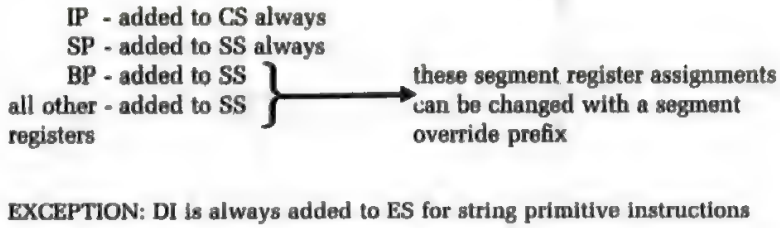


Figure 6: *Default segment register assignments.*



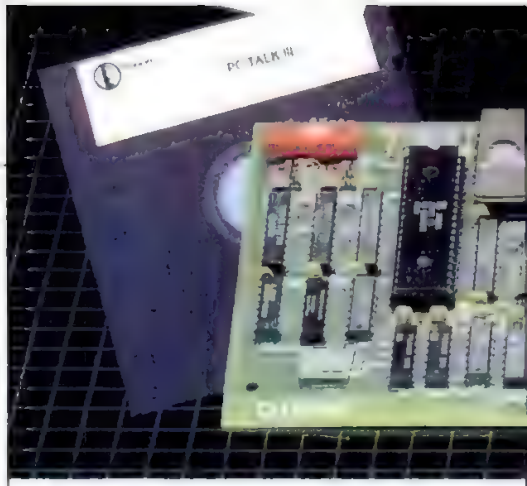
EXCEPTION: DI is always added to ES for string primitive instructions

done (i.e., where arithmetic results could be accumulated). In the 8088, arithmetic operations can be done in all registers excep the segment and control registers.

The BX register has a special use in addressing memory. It's sometimes called the base register. The CX register is often used to contain a "count" value for certain repetitive instructions. For example, there is a LOOP instruction that works like BASIC's FOR . . . NEXT loop. The number of times the loop is repeated is determined by the value in CX. The DX, or "data" register, has only one special use, and that is to contain the I/O port address for input and output instructions.

The pointer and index register group consists of four 16-bit registers; the base pointer (BP) register, the stack pointer (SP) register, the source index (SI) register and the destination index (DI) register. These registers cannot be accessed in 8-bit pieces, but they can be used if desired for general purpose arithmetic and logic operations. The two pointer registers are typically used for reading and writing values from a data structure called a "stack". Similarly the two index registers are primarily used for addressing memory.

An absolutely essential group of registers consists of the instruction pointer (IP) and the flags register. The IP points to (contains the address of) the next instruction to be fetched from memory, as discussed in the description of our paper and pencil computer. The value of the IP may be changed in two ways. Just after each instruction byte is fetched from memory, the IP is always incremented by 1. This is the normal way the IP changes. The other method is for the IP to be loaded with a completely new value by a jump or call instruction. These instructions allow program execution to skip around anywhere in memory. It's like the difference between turning the pages of a book one

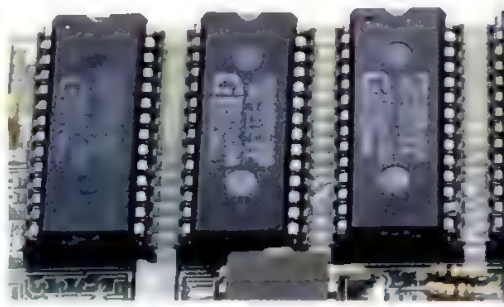


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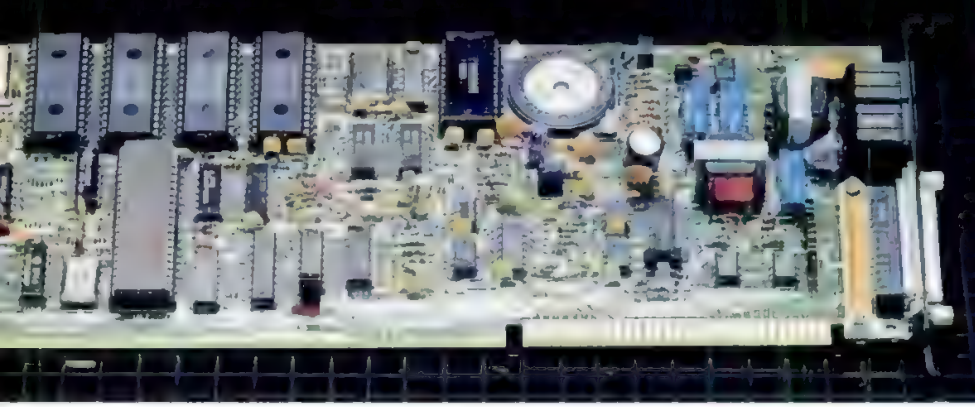


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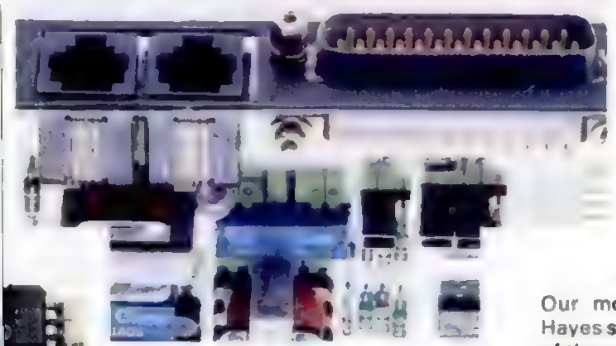
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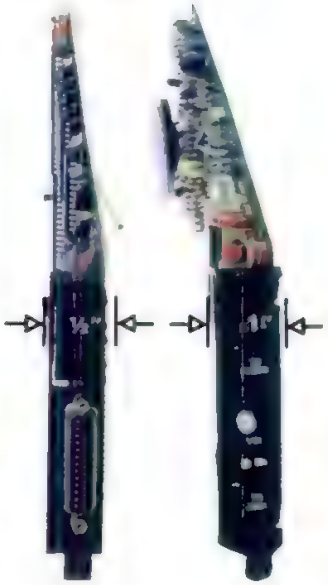
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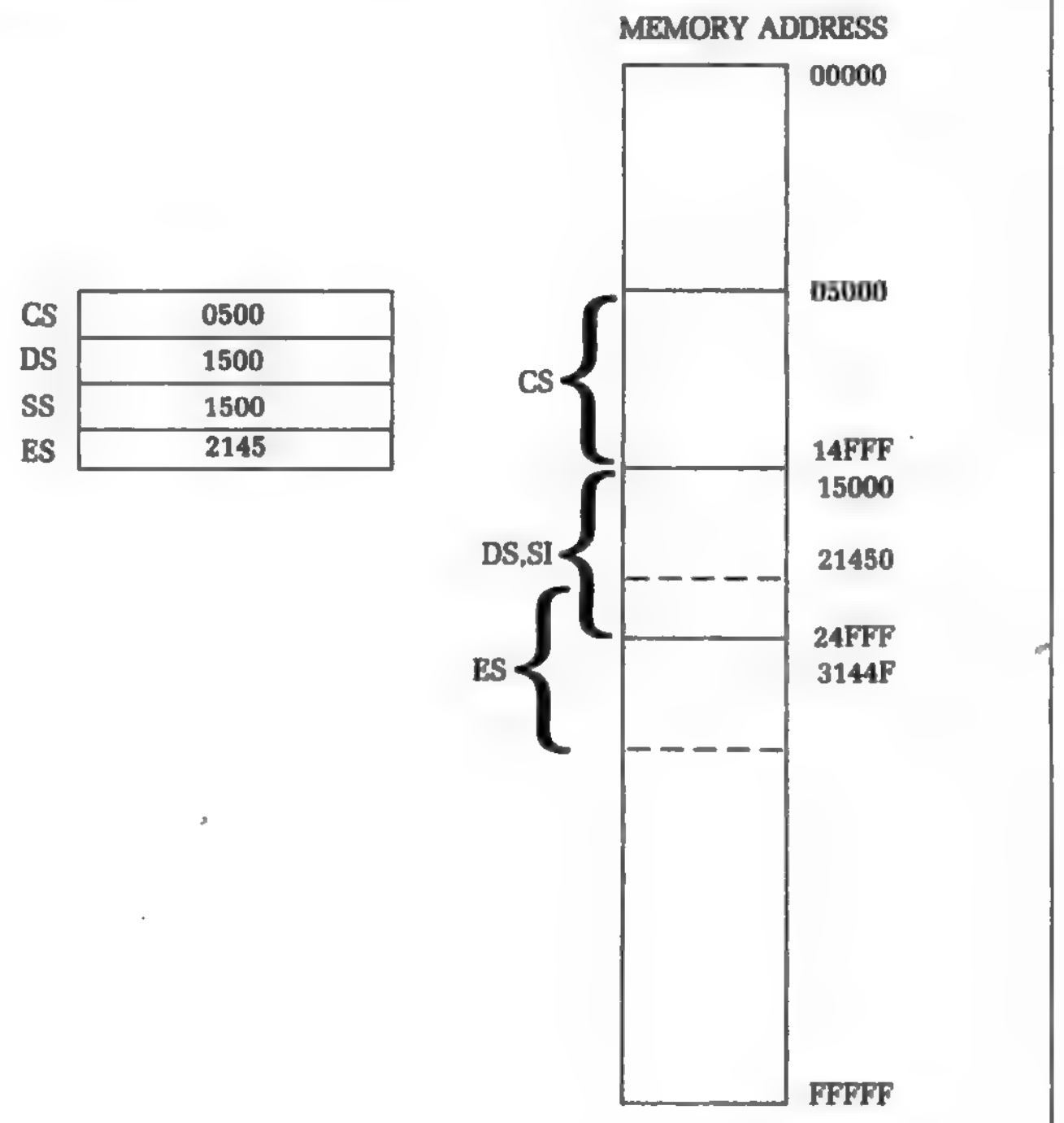
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Figure 7: An example of how memory segments are addressed using the segment registers.



by one, and skipping from one chapter to another. The IP cannot be changed by a MOV instruction and it cannot be used as a general purpose register.

The flags register is not a normal register. Instead it's a collection of "flag bits" (or "flags" for short). A flag is just a flip-flop in the CPU which is set to 1 or reset to Ø depending on the result of the last arithmetic or logical operation. You might think of them as being the computer equivalent of the warning lights on your car's dashboard. These lights are either on or off, depending on the state of your car. If the oil pressure drops too low, a light goes on. If the oil pressure is OK, the light is off. An example of computer flag operation would be the following: If the BX register contents are subtracted from the AX register contents, one of the flags, called the zero flag, will be set if the result is zero.

Finally, there is a group of 16-bit registers called the segment registers. These registers are intimately connected with the way the 8Ø88 addresses memory.

The Segment Registers

To understand how the segment registers are used, we have to understand how the 8Ø88 addresses memory. Unlike the previous generation of 8-bit microprocessors such as the 65Ø2, the Z8Ø, and the 68Ø9, which all could access only 64 kilobytes of memory, the 8Ø88 can directly access 1 megabyte of memory. This is very handy, since memory has become so inexpensive. We cannot imagine running on machines with less than 128K, if that little! However, there's a price to be paid for this capability. As we've seen, the 8Ø88 registers, and in particular the IP, are only 16 bits wide. This means that only 2^{16} =65,536 different memory locations can be accessed by the IP. How can the

8088 address a megabyte of memory?

The answer is that whenever the 8088 sends out a memory address, it is always a 20-bit address formed from the sum of a segment register and one of the other registers (or in some cases a 16-bit address contained in the instruction or memory). The sum is done in the following way: The segment register contents are shifted left 4 bits, (i.e., by one hex digit) and then added to the contents of the other register. For example, when an instruction is fetched from memory, the address is the sum of the IP and the code segment register, CS. Figure 5 illustrates the process by which a memory address is formed. If IP contains 0100H and CS contains 0200H, the memory address sent out by the CPU would be 02100H. The formation of a 20-bit address is automatically done by hardware in the 8088 and is not under the programmer's control. To refer to such an address concisely, we often write it as CS:IP, so that in the example just given, CS:IP=200:100. The IBM DEBUG program always gives addresses in this format.

The fact that two registers have to be added to obtain a 20-bit address may seem somewhat awkward, and in certain cases it is. Newer microprocessors such as the Motorola 68000 and the National 16000 have 32-bit-wide internal registers and can directly address many megabytes of memory. At the time the 8088 was designed, microprocessors of this complexity were not yet feasible. On the other hand, there is a disadvantage to having 32-bit-wide registers, namely that programs on such machines require a lot more memory than they do on the 8088. A Pascal compiler currently available for the 68000 requires a *minimum* of 512 kilobytes of memory!

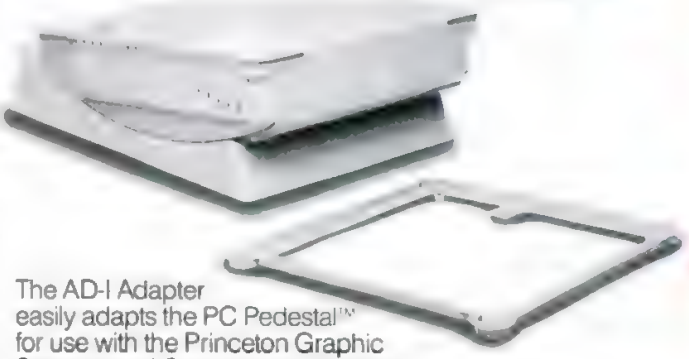
All memory accesses by the 8088 are done with 20-bit addresses. When data is moved to or from memory with the MOV instruction, a 20-bit address is formed using the data segment (DS) register. For example, the instruction:

```
MOV   AL,[100]
```

moves data into AL from location 100 plus DS shifted left 4 bits. There is also a stack segment register (SS) which is added to the pointer registers SS or BP to obtain an address. Finally, there is the extra segment

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(ES) register which is primarily used together with DI to form a 20-bit address for certain "string primitive" operations. Figure 6 shows the default segment register assignments for the 8088. Segment override prefixes can be used to change the default assignments.

The picture of memory that emerges from all this is as follows: Each segment register points to the beginning address of a 64-kilobyte block of memory (called a segment) located within a 1-megabyte memory space, and this 64-kilobyte segment can start at any address which is a multiple of 16 (because of the 4-bit left shift used to form a 20-bit address). Figure 7 shows how a map of memory would look for one set of values in the segment registers. The memory segments pointed to by the CS, DS, SS, and ES registers can totally or partially overlap, or they can point to totally different areas of memory. There are no restrictions.

Fortunately, 95 percent of the time, you'll be able to simply ignore the fact that such things as segment registers exist. The reason for this is that the operating system initializes the segment register values for you when it loads your program into memory for execution. Hence, unless your program and data amount to more than 64 kilobytes (and few assembly language programs even approach this size), you can simply think of all your addresses as being 16 bits. The segment registers just provide a fixed offset into the memory address space. This also means that whatever other programs are stored in memory below your program, (e.g., special I/O drivers or a "RAM disk"), do not change your 16-bit addresses; they only change the segment registers. This is a kind of "relocation" technique that proves to be very useful.

Some Simple Assembly Language Examples

One of the best ways to get a firm grasp of the ideas presented in this chapter and to learn some new things besides, is to try out some examples of assembly language programming for yourself. In this section we present some suitable examples for doing this. The intent is that these programs be entered and run using the DEBUG program that comes with PC-DOS.

The DEBUG program is an example of a type of program called a "debugger." This name comes from the fact that errors in a

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Figure 8: A simple program that adds 8 to the value stored in memory location [200].

```
XXXX:0100 B0 08       MOV   AL,8 ;Set AL to the constant 8
XXXX:0102 00 06 00 02 ADD   [200],AL ;Add AL to the contents of 200
```

Figure 9: A program that calculates the sum of the integers from 1 to 10.

```
XXXX:0100 B9 01 00   MOV  CX,1 ;1 is first integer to be added
XXXX:0103 B8 00 00   MOV  AX,0 ;initialize the sum to zero
XXXX:0106 03 C1      ADD  AX,CX ;add an integer to the sum
XXXX:0108 41               INC CX ;increment the integer by 1
XXXX:0109 83 F9 0A   CMP  CX,0A ;is the new integer greater than 10?
XXXX:010C 76 F8      JBE  106 ;jump back to address 106 if not
XXXX:010E 90               NOP ;at this point the sum will be in AX
```

Figure 10: A shortened version of the previous program.

```
XXXX:0100 B9 0A 00   MOV    CX,0A ;10 is first integer to be added
XXXX:0103 B8 00 00   MOV    AX,0 ;initialize the sum to zero
XXXX:0106 03 C1      ADD    AX,CX ;add an integer to the sum
XXXX:0108 41 FC      LOOP   106 ;decrement CX and loop unless CX=0
XXXX:010A 90                NOP ;at this point the sum will be in AX
```

computer program are called "bugs." Hence, debuggers are programs that assist you in finding and removing bugs. The IBM DEBUG program does this by allowing you to enter, change, and trace the operation of your programs. Programs can be entered under DEBUG using machine language or, with PC-DOS 2.0 and later versions, using assembly language.

This section is not intended to be a substitute for the DEBUG manual, but before we present the examples, it may be worthwhile to make a few comments regarding the way addresses are entered and displayed by DEBUG. Addresses are shown in the form XXXX:YYYY where XXXX and YYYY are 16-bit hex numbers. This represents a 20-bit memory address which is the sum of XXXX0 and YYYY. Thus, DEBUG gives addresses in the same way that addresses are formed in the 8088, namely by summing a left-shifted segment register and some other 16-bit register. The tricky thing about giving addresses this way is that the same address can be written in many different ways. For example, the memory address 12345 can be written as 1234:0005, or as 1230:0045, or as 1233:0015, etc. This takes a little getting used to, but causes few problems once you get the hang of it.

Let's start out by looking at Figure 8, the same program discussed in our previous examples. We've shown the program addresses in the leftmost column, then the machine language, and finally the assembly language. The segment portion of the address is left as XXXX here because this value varies from one IBM PC to another depending on the equipment installed in the PC and the version of the operating system being used. The segment portion of the address will automatically be chosen for you when DEBUG is loaded and will remain fixed unless you change it. Thus if you want to enter this program in machine language, just type E100(enter) [(enter) denotes pressing the ENTER key] and then type B0 08 00 06 00 02. Similarly, to enter the program in assembly language, type A100(enter) and then type MOV AL,8(enter), ADD [200],AL(enter). DEBUG will automatically translate the assembly language to machine language and enter the machine language into memory.

Once you've entered the program into memory, you can look at it again using U100(enter), which will translate the machine language back into assembly language and display it on the screen. You can look at the machine language or the numbers contained in memory locations alone with the "D" command.

To see how the program executes, first

type R(enter). This will display the current register contents on the screen. The IP should contain 1ØØ, so that it's pointing at the first instruction of the program. Now use the "T" command to single step through the program, watching what each instruction does. (The earlier discussion of this program describes the action that is performed by each instruction.) After each step, the register contents are displayed along with the instruction that will be executed when you do the next single step (not the instruction that just was executed). To start the program over again, use the "R" command (as described in the DOS manual) to reset IP to 1ØØ again. You can examine the contents of location XXXX:2ØØ at any time using the "D" command. You might also be interested to know that the action taken by this entire little program can be done using only one instruction, namely:

ADD BYTE PTR [2ØØ],8

Try it! We wrote it as two simpler instructions for illustrative purposes only. You are probably asking yourself why the "BYTE PTR" is there. It's there to tell the assembler (or DEBUG) to assemble the code for adding a byte, rather than a word. To add 8 to a word starting at 2ØØ, we'd enter:

ADD WORD PTR [2ØØ],8

PTR stands for PointTeR.

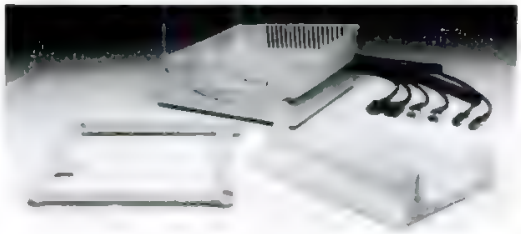
Now look at Figure 9, a slightly more complex program that calculates the sum of the integers 1 through 1Ø. The operation of the first three instructions here should be self evident by now, and the INC instruction is a shorthand way to add 1 to something. The compare (CMP) and jump-if-below-or-equal (JBE) instructions work together. CMP CX,OA compares the contents of CX with the number OA. The result of the comparison is stored in the flags, and used by the JBE instruction. If the number in CX was below (less than) or equal to OA, then the JBE 1Ø6 instruction puts a 1Ø6 into IP so that the next instruction to be executed is ADD AX,CX. If CX was greater than OA, the JBE 1Ø6 instruction does nothing, and the next instruction to be executed is NOP. The two instructions are the assembly language equivalent of the BASIC statement:

IF CX<=1Ø THEN GOTO 1Ø6

The NOP instruction is a do nothing

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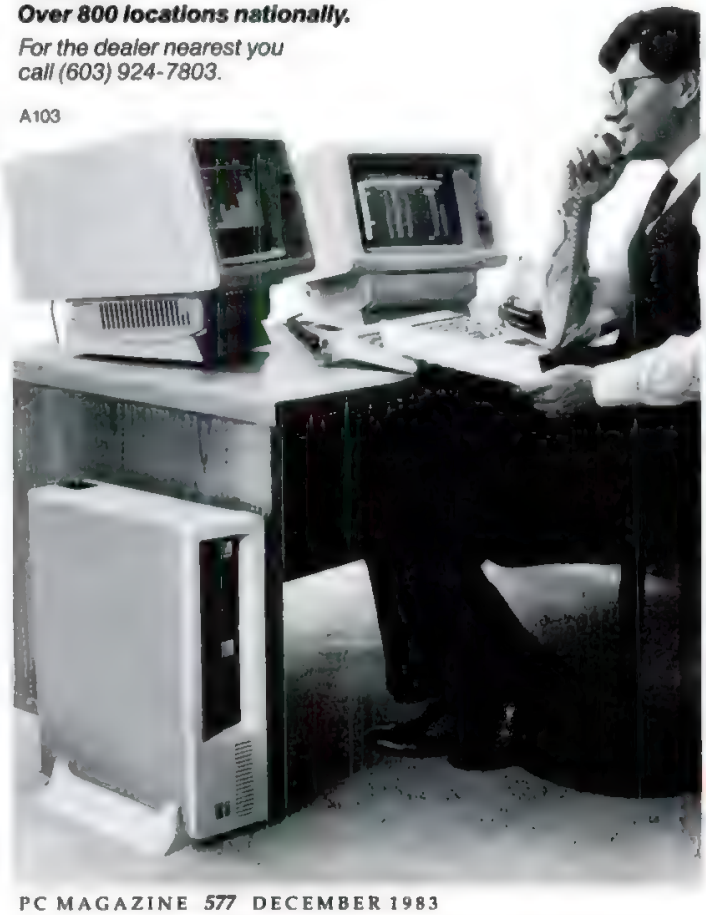
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instruction; it stands for "no operation". We've put it at the end of the program just to have a place to refer to as the end of the program.

You can single step through this program with the "T" command or you can just execute it to find the sum by using the "G" command. If IP is set to 1ØØ, just type:

G10E(enter)

The program will then execute until it reaches address 1ØE, and then will stop and display the registers. Don't just type G (enter), or the 8Ø88 will attempt to execute the contents of the uninitialized memory locations following the program as instructions, and will probably crash.

Now let's recode this program with a new twist to it. In Figure 10 we shortened the program by doing the addition in reverse order. We've eliminated two instructions by using the LOOP instruction. This instruction performs three operations in one instruction. It decrements CX (subtracts 1 from it), compares CX with Ø, and then jumps to address 1Ø6 if CX is not zero. It's rather like BASIC's FOR . . . NEXT loop with CX serving as the counter variable. Doing the additions starting with 1Ø allows us to use this powerful instruction and reduce the length of the program. There's a general principle at work here, namely that whenever you need to increase the speed or reduce the size of a critical program section, look for ways of redoing the logic in a fashion that takes advantage of the 8Ø88 instruction set's strengths.

If you look at the machine language for this program and the previous one, you'll see that the JBE and LOOP instructions don't directly contain the address 1Ø6 where the program execution is supposed to jump to. Instead, they contain a signed 8-bit binary number as the second byte of the instruction that gives the displacement that must be added to the current value of the IP to reach the desired address. Check this out for yourself to see that it works. The reason for doing things this way is that it makes the machine code "relocatable"; i.e., you can move the program so that it starts at a different memory address and it will still run correctly. This is a very valuable feature to have in a program. A second reason is that a target address can be given in a single byte. Of course, this greatly restricts the range of



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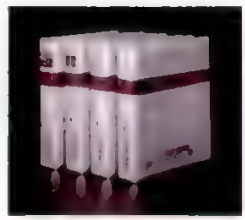
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conditional jumps (in contrast to the earlier 8ø8ø and Z8ø microprocessors).

Now look at Figure 11, a program that actually produces some visible results on the screen, namely one that prints the word "HELLO" on the screen. To enter the ASCII string at the end of the program use the "E" command. Try this one out using G11ø (enter). You should see the word "HELLO" appear on the screen.

This program introduces two new concepts. First, we see a new way to move a value from memory into a register. The MOV DL,[BX] instruction moves the contents of the memory location whose address is contained in BX into DL. Think of BX as playing the role of a "pointer" which points to the memory location where the desired data is. The advantage of using this rather than using MOV DL, [2øø], is that we can point to another memory location by just changing the contents of BX, and thus re-use the MOV DL,[BX] instruction inside a program loop.

The second new idea is that of a "DOS function call." The disk operating system contains a number of functions (which are just small programs) that handle input and output (I/O) for the keyboard, the CRT screen, the printer, and the disk drives. With PC-DOS, you can use these DOS functions yourself by means of the software interrupt instruction (INT). The INT instruction works as follows: The number following INT is used by the 8ø88 to find an address in a table in low memory of the IBM PC, and program execution jumps to the address found in that table when an INT is executed. When the function call ends (with an IRET instruction), program execution resumes at the next instruction following the INT. Thus the INT instruction works rather like BASIC's GOSUB instruction. INT provides a very powerful method of controlling I/O devices. In fact, you can write your own function calls that can replace the PC-DOS calls and handle your I/O devices in any way you desire.

One particular interrupt, namely INT 21, is used to reach the I/O functions present in PC-DOS. Which function is executed depends on the number present in AH when the INT 21 is executed. Appendix D of your DOS manual describes the various function calls available. In the program above, the PC-DOS function call used is function 6, direct console I/O. When this function is called via INT 21, the DL register must contain the character

Figure 11: A program that prints the word "HELLO" on the screen.

```
XXXX:0100 BB 20 01        MOV     BX,120 ;Point BX at string to output
XXXX:0103 B9 05 00        MOV     CX,5 ;CX has no. of chars to output
XXXX:0106 8A 17           MOV     DL,[BX] ;Get a character
XXXX:0108 B4 06           MOV     AH,6 ;Call DOS function 6
XXXX:010A CD 21           INT     21
XXXX:010C FF C3           INC     BX ;Point BX at next character
XXXX:010E E2 F6           LOOP    106 ;Look back till 5 chars done
XXXX:0110 90                      NOP
XXXX:0120 48 45 4C 4C 4F      ;ASCII string to output
```

Figure 12: A program using PC-DOS function calls. It reads what is typed at the keyboard and prints it on the screen.

```
XXXX:0100 B4 06      MOV  AH,06 ;set up for DOS function call 6
XXXX:0102 B2 FF      MOV  DL,FF ;To do keyboard input set DL=FF
XXXX:0104 CD 21      INT  21 ;Check the keyboard
XXXX:0106 74 FC      JZ   100 ;Check again if zero flag set
XXXX:0108 8A D0      MOV  DL,AL ;Else move character into DL
XXXX:010A CD 21      INT  21 ;And output to screen
XXXX:010C E9 F3 FF   JMP  102 ;Loop back for more input
```

that you want written on the screen. Hence, in the little program above, we load ASCII characters from memory locations 12Ø–124 into DL and do an INT 21 each time.

One word of caution about using the "T" command to trace program execution through an INT instruction. If you do this, you'll find yourself single stepping through the PC-DOS function call program, and this program is very long. You may find it educational to look at this code, but be prepared to single step for a long time. If you get tired single stepping and use the G command—e.g., G1ØC (enter)—to get out of the function call routine, you may find that the computer doesn't return properly to your program. This is a program bug in the current version of DEBUG; it will probably be fixed in later versions. The best procedure for single stepping through programs containing an INT is to use the "T" command until you reach the INT, and then to use the "G" command to get to the next instruction following INT. In the example above, use "T" to get to address 1ØA, then use G1ØC (enter) to get past the function call.

PC-DOS function calls can also be used to read values in from the keyboard. Figure 12 is a little example that reads the keyboard and then simply prints what's typed on the screen.

Here we use another feature of PC-DOS function call 6; namely that if DL=FF when the INT is executed, the DOS program will look at the keyboard input and see if a character was typed. If one has been typed, it returns to your program with the character in AL; otherwise, it returns AL=Ø and sets the zero flag. The instruction jump-if-zero (JZ) jumps back to the INT again if no character was typed, so that the program hangs in a little loop repeatedly executing INT 21 until a character is typed. When one is typed, it's printed on the screen and then the program goes back to look at the keyboard again.

The pair of instructions INT 21 and JZ 1Ø4 is a nice example of what's called a "polling loop." This is one popular method of slowing down the computer so that it can receive input data that comes in at a much slower rate than the computer is capable of receiving. You simply have the computer hang in a little loop, waiting for some signal which indicates that new input data is available. To get some idea of the speed at which the computer receives data, you might ponder the fact that the computer executes the polling loop in the above program several hundred times during the time it takes you to depress a single key on the keyboard.

As our final example, Figure 13 is a program that takes the binary number in AL and prints it on the screen. To do this we convert the number into two hex digits, and then encode each hex digit as ASCII. As you can see, simply printing out an 8-bit binary number in hexadecimal on the screen takes a bit of effort. The number is split up into two nibbles (4-bit chunks).

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Figure 13: A program that takes the binary number stored in AL and prints it on the screen as two hexadecimal digits.

```
XXXX:0100 8A D0      MOV  DL,AL ;Put the number in DL
XXXX:0102 D0 EA      SHR  DL,1 ;Shift high nibble into low nibble
XXXX:0104 D0 EA      SHR  DL,1
XXXX:0106 D0 EA      SHR  DL,1
XXXX:0108 D0 EA      SHR  DL,1
XXXX:010A E8 09 00   CALL 116 ;Convert nibble to ASCII & print it
XXXX:010D 8A D0      MOV  DL,AL ;Move number into DL again
XXXX:010F 80 E2 0F   AND  DL,0F ;Zero out high nibble
XXXX:0112 E8 01 00   CALL 116 ;Convert nibble to ASCII & print it
XXXX:0115 90         NOP ;End of main program
XXXX:0116 82 C2 30   ADD  DL,30 ;Convert hex to ASCII by adding 30H
XXXX:0119 82 FA 39   CMP  DL,39 ;Is digit between 0 and 9?
XXXX:011C 76 03      JBE  121 ;Conversion complete if so
XXXX:011E 82 C2 07   ADD  DL,7 ;Must add 7 more if digit is A-F
XXXX:0121 B4 06      MOV  AH,6 ;Print character in DL on screen
XXXX:0123 CD 21      INT  21
XXXX:0125 C3         RET ;End of subroutine
```

The high order nibble is treated first by shifting it 4 bits to the right (with SHR, the shift right instruction) so that it occupies the position originally held by the low order nibble. The SHR instruction also moves zeros into the high order bits. We then do the conversion of this nibble to ASCII by CALLing a subroutine. The CALL instruction works like BASIC's GOSUB instruction. Program execution transfers to the start of the subroutine (address 116) and continues until a return (RET) instruction is encountered. Program execution then transfers back to the instruction following the CALL. As in BASIC, whenever a piece of code occurs more than once in a program, you should consider making it into a subroutine. The resulting program is not only shorter, but is also easier to understand.

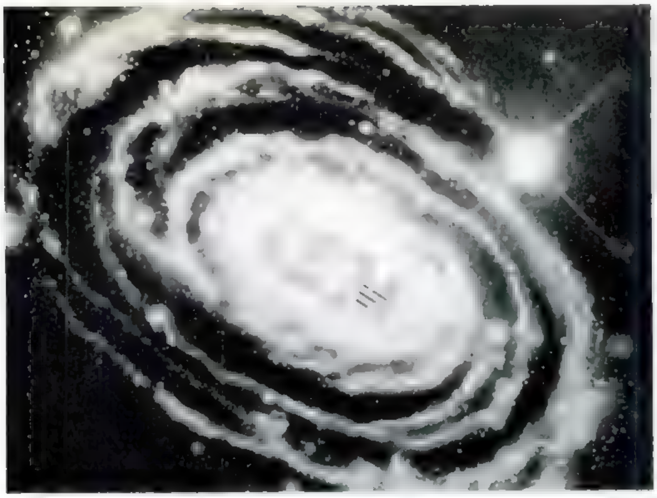
If you look at the ASCII table, you can see why the conversion to ASCII is done the way it is. The ASCII code for Ø is 3ØH, the code for 1 is 31H, and so on. However, there's a gap of seven characters between an ASCII "9" and an ASCII "A", so we must add an additional 7 if the hex digit is between A and F.

To treat the low order nibble, we need to zero out the high order nibble. This is conveniently done with an AND DL,ØF instruction. All we need to know about it for now is that it sets all bits in DL to zero that are zero in the hex number ØF.

By the way, one point that is often misunderstood by beginners is the fact that when you do a single step in a program using DEBUG, there is a great deal more going on than meets the eye. It's easy to think that when you type "T", the 8Ø88 just executes one instruction, shows you the register contents, and sits there doing nothing until you type something else. When you type "T", you actually initiate the execution of a very substantial program. First, the 8Ø88 looks up in a memory table the values that were supposed to be in the registers at this point in your program. Then it loads up all the registers, executes the instruction, and saves all the register values in memory again. These values are converted to ASCII and printed on the screen as in the program above. Finally, DEBUG goes into a loop (as in our echo program example), looking at the keyboard waiting for a character to be typed. Thus, the simple appearance of single stepping through a program is actually a clever illusion.

The examples presented in this section should give you an idea of what assembly language programming with the 8Ø88 is like. The 8Ø88 instruction set, at first glance, looks very complicated. But, after you've worked with it for a while, you'll find that most of it falls into a few logically related groups and is very straight-forward to learn. */PC*

Murray Sargent III and Richard L. Shoemaker are professors of optical sciences at the University of Arizona in Tucson. Sargent and Shoemaker previously collaborated on Interfacing Microcomputers To The Real World, *also published by Addison-Wesley.*



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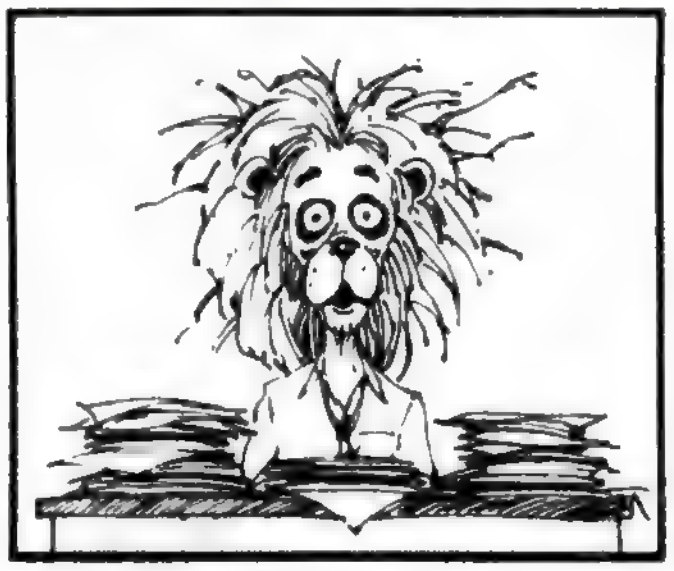
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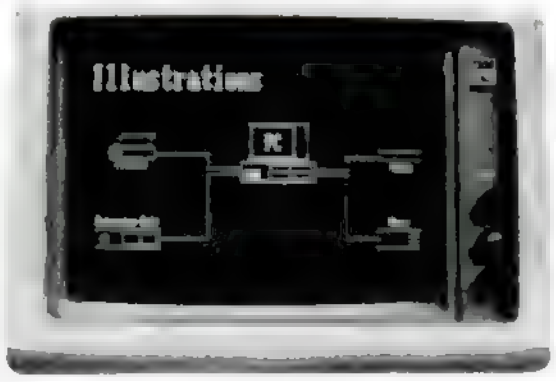
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Imagine this scenario: Eton Electronics (a fictitious corporation) decides to develop new word processing software to be offered with its line of office computers. Since Eton does not have in-house programmers capable of writing software of such complexity, its management turns to a couple of free-lance programmers—call them Andy and Mike—who have experience in developing word processing software. Following a meeting between Andy, Mike and Eton management, it is agreed that Eton will supply specifications for the new software to Andy and Mike who will deliver the software to Eton within 6 months. A fixed fee for the development is agreed upon. One-third of the fee will be paid to Andy and Mike up front; another one-third will be paid upon delivery and successful testing of the software by Eton; and the remainder will be paid upon submission of all documentation to Eton. The question of copyright ownership is never discussed. Andy and Mike develop software and documentation according to specification, and deliver to Eton on time. Following debugging, the software tests successfully, and final payment is made. Eton registers a copyright on the software with the U.S. Copyright Office.

A few months later, Andy is approached by Ame Corporation (fictitious) to develop word processing software according to specifications that are similar to Eton's. Without notifying Mike or Eton, Andy grants a nonexclusive license to Ame to use the software that he and Mike originally developed for Eton.

COPYRIGHTS cover the written expression of a program, not the ideas contained therein.

Subsequently, Eton brings suit in District Court to stop Andy from licensing the software on the ground that Eton alone owns the software. Mike files suit against Andy to have the license to Ame voided, since Mike, as coprogrammer, never consented to the license.

How do you think the judge would rule under current United States copyright law? Probably not as you expected; Andy would win against both Mike and Eton.

To understand how such a result could occur and to help you avoid situations like this, you need to know something about programming for hire under current copyright law.

Knowing Your Copyrights

Copyrights provide the owner with the exclusive right to make or distribute copies of the copyrighted work. This right comes into being upon creation of the work in a fixed, tangible form. For example, if you are a programmer, you, or possibly your employer can obtain a copyright on software as soon as the software is presented in written form. Copyrights cover the written expression of a program, not the ideas contained therein. Copyright does not prevent another programmer from independently developing the same

PC BRAND went shopping in Japan



Not just another me-too printer, but the best for the money we've seen yet.

We have come up with the best value in true letter-quality printers on the market. Take the time to read this ad, and we'll prove it to you.

What's been the persistent dilemma in buying a printer for a personal computer? Top performance letter-quality printers have always been expensive. The lower priced attempts have proved clumsy, noisy, and slo-o-o-w. And don't be fooled by "correspondence quality" claims for matrix printers: there is no way around the fact that they produce characters from dot patterns. Letters and reports just don't look, well, *typed*. If you want fully-formed characters, and a true typewritten look, there is no shortcut. Now comes the perfect combination: a low-cost, truly letter-quality printer, with a housing that makes it look much more costly—and it is even fast! The Juki 6100.

We benchmarked the nearest approximations, the Silver-Reed EXP 550, the Brother HR-1, and the Smith-Corona TP-1. Good products all. But then we put the Juki 6100 through its paces against this checklist:

1. **Print Quality**
2. **Print Speed**
3. **Noise level**
4. **Reliability**
5. **Warranty**
6. **Versatility**
7. **Physical Specifications**
8. **Ease of Installation & Use**
9. **Price**

1. Print Quality. This is where it really shines. Our printer uses print wheels and ribbons designed not for computer printers, but for *typewriters*—where the standards for "letter quality" are set. The printwheels are Triumph-Adler style: true typewriter quality, because that's what they were designed for. What's more, the printer uses IBM's Selectric II typewriter cartridges, so enough said about quality of the ink and the print impression. Chances are you already stock these cartridges in your supplies cabinet.

2. Print Speed. Using the standard Shannon test for plain text, we do a true 18 characters per second. That exceeds all three rival printers, and is half again faster that the Smith-Corona. But there is more. The Juki designers put in logic-seeking bi-directional printing and high speed motion over blank spaces. This means that typing speed on typical text is as fast as printers with much faster ratings. And there is a built-in 2,000 character buffer in the printer to free up your computer even before the printing is done.

3. Noise level. Quiet level is more accurate. The technical rating is better than 62 dBA from 1 meter away. If you don't know a dBA from a D&B, it means no raucous clatter to rattle the nerves or jam your phone conversations, a big improvement over some printers we listened to. The other three are *two to eight times noisier.*

4. Reliability. The engineers know what an MTBF of 2500 hours at 25% duty means. More meaningful for most of us: there are very few moving parts. Other printers employ a complex system of electric motors, wires pullies, and springs. Not only do they breakdown, they also go out of adjustment. But the Juki uses a far more elegant design: the printhead glides across a rail by magnetic traction. That's all there is to it. If you look inside, you will see a startling simplicity.

5. Warranty. We give you a full 90 days limited warranty which covers parts and labor, but we don't think you'll be testing this part of our offer. Still, it's nice to know it's there. It means you really cannot go wrong by ordering and putting this printer through its paces.

SEE PAGES 591 & 592 FOR OUR COMPLETE LINE OF SUPPLIES AND ORDER CARD

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and brought home a major discovery!

6. Versatility. The is a virtually unlimited choice of type styles to choose from—over 100 in the catalogue we checked. Our printer can print at 10, 12 and 15 characters per inch and also take Proportional Spaced wheels for that extra touch of class. We also have an economical and reliable bi-directional forms tractor as an option, if you want to handle continuous stationery, or print graphics including the use of reverse-paper motions.

We supply a 100-character Courier 10-pitch (characters per inch) printwheel with the full ASCII character set and extra Word Processing symbols. The other three printers can't match that: Smith-Corona has only 88.

7. Physical Specifications.

Print Speed:	18 characters/second
Daisywheel:	Triumph-Adler compatible Drops into place
Printing Characters:	100 per wheel
Printed Line Length:	110 characters under 10 pitch 132 characters under 12 pitch 165 characters under 15 pitch 82 to 220 characters under proportional spacing mode
Horizontal Resolution:	1/120 inch minimum
Vertical Resolution:	1/48 inch (1/96 inch possible by using escape sequence)
Platen Size:	13 inches (Printing line 11 inches)
Ribbon:	IBM82 Compatible multi-strike or single strike (Selectric II)
Interface:	Centronics parallel
Power Consumption:	40 W idling, average 80 W printing
Dimensions:	Width: 20.5", Depth: 17.9", Height 5.9"
Weight:	31 lbs.
Environment:	Ambient Temperature: 41° to 95° Farenheit Relative Humidity: 30% to 85%
MTBF:	2,500 hours at 25% duty
MTTR:	15 minutes
Noise:	Less than 62 dBA at 1 meter distance
Buffer Memory Size:	2K bytes
Options:	Bi-Directional Forms Tractor, $169.00

8. Ease of Installation and Use. The Juki is fully compatible with your IBM PC or XT. Just plug it into the parallel printer port.

- We don't send you on a search for a cable to make things happen. It's in the box.
- And it's exasperating to be all set to go—but no ribbon. So we give you a ribbon. Loading is clean and simple—it's an IBM Selectric style cartridge, remember.
- We also give you a printwheel: a courier 10 (characters to the inch), the most popular typeface. The fun comes in loading it: just pull back a lever, and **drop it in**. No cover or ribbon removal, no inky fingers. No figuring out why it doesn't attach. It drops into a recess and the printer engages it entirely on its own!
- And one more thing. In the continental United States, **we pay the shipping!**

9. Price. $579.00 complete with power cable, computer connection cable, printwheel, and ribbon cartridge, and freight. It's all there! Everything you need to have this handsome printer typing crisp, perfect pages minutes out of the box.

We wouldn't spend two pages if we weren't onto something big. Make the same discovery. Call us right now. Use our 800 number.

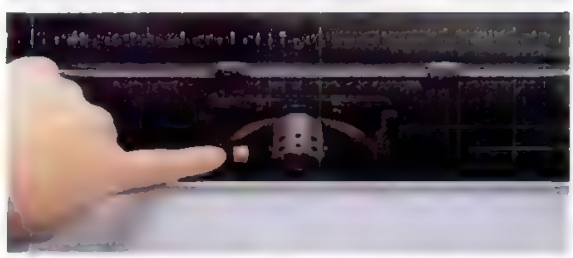
	Product Code	Price
Juki 6100 Printer, with cable:	J6100	$579
Bi-Directional Forms Tractor (optional):	J6150	$169





Above: Easily accessed controls are on the front panel. The printhead, ribbon, and printwheel are mounted as a single mechanism. Below: The printwheel simply drops into place; the printer engages it automatically!





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program as the copyrighted one. Copyright definitely covers source code, although there is some uncertainty as to whether object code is covered by copyright. However, the software manual and other documentation can be protected by copyright.

To be able to enforce a copyright in Federal Court and to obtain other important benefits of copyrights, registration with the Copyright Office in Washington, D.C. should be made as soon as possible. This requires filling out and submitting a special form, depositing the software with the Copyright Office, and paying a small fee. Published copies of the software should include a copyright notice (for example, Copyright John Smith 1983).

On January 1, 1978, copyright law changed and the free-lance programmer came out ahead.

Who receives copyright ownership—the programmer or the person paying to have the software written? Under copyright law as it existed prior to January 1, 1978, the one who paid for the work was the copyright owner, barring an express agreement to the contrary. Therefore, in any instance involving an employer and an in-house programmer, the employer owned the software. This held true even when the software was contracted out to a free-lance programmer.

On January 1, 1978, copyright law changed and the tables were turned. The free-lance programmer came out ahead. Under the new law, copyright ownership of software generally is held by the programmer. Only if the work is made for hire does the employer or other person for whom the work was prepared own the copyright, unless otherwise agreed.

But what is a work "made for hire"? In accordance with copyright law, a work made for hire is either prepared by an employee within the scope of his or her employment (for example, an in-house programmer), or is specially ordered or commissioned (for example, free-lance programmer). In the latter case, the work must fall within certain categories and there must be a written and signed agreement between parties stating that the work shall be considered a work made for hire. These categories include: a contribution to a collective work (for example, one chapter in a text); a part of an audio-visual work; a translation; a supplementary work (defined as a secondary adjunct to a work, such as a foreword, musical arrangement, or bibliography); a compilation; and an instructional text.

What constitutes a work "prepared by an employee within the scope of his or her employment" depends upon the facts of the particular situation. A programmer-employee who writes programs on the job for the company probably is working within the scope of his employment. Even if there is no employee agreement covering ownership of any copyrights on the software, ownership is assigned to the company. The essential factor in determining whether an employee created his work within the scope of his duties is whether the employer possessed the right to direct and supervise the manner in which the work is being performed. Other factors include: (*a*) whether the work was created at the request, expense, time, and facilities of the employer; (*b*) the nature and amount of compensation received by the employee; and (*c*) whether the employee received employee benefits, such as FICA payments.

But what if the employee works on software at home? Generally, the answer depends on the type of software involved. If the program falls within the company's software line, the copyright probably belongs to the company. If the program has little utility within the company but has general utility outside the company, however, the copyright probably belongs to the programmer.

On the Dotted Line

What if the person who develops the program was not actually hired as a programmer, but rather as a software development manager? In practice, many software development managers write or contribute to software in addition to supervising. Here, the company may not own the copyright in the software since actual writing of software may not be within the job description of the manager. To be on the safe side, the company should require management to sign employee agreements specifying that the job includes writing software and that any software written during employment belongs to the company. This type of agreement should be made not only with management but with each employee involved with software development, even if not hired specifically to write software.

When outside contractors are involved, the result often is opposite from that of an employee working in-house on company software. Many companies make extensive use of free-lance programmers and outside software houses to develop software. Unless an express agreement involving ownership of the software exists, the copyright will likely be owned by the programmer, not by the company. The reason for this is that free-lancers generally are brought in because there is no in-house capability to develop the software. The employer, therefore, will not be able to direct and supervise the manner in which the work is being performed. And even if the employer has the capability to direct and supervise the work, he probably does not want to. After all, that's why he contracted out.

If the program falls within the company's software line, the copyright probably belongs to the company.

Assuming that the company does not have the right to direct and supervise the work, the company will still own the copyright if there is an agreement signed by the company and free-lancer stating that the work is made for hire under copyright law *and* the work falls within one of the special classifications applicable to free-lancers. As a practical matter, many software development projects will not fall directly within one of these classifica-

tions. It can be argued, however, that the development of a subroutine is a "contribution to a collective work," that a conversion of software from one language to another is a "translation," and that patches are supplemental works. Documentation may be considered an "instructional text," and a graphic display may qualify as an "audio-visual work."

In a recent case decided by the Federal District Court in Texas, a computer company commissioned an outside software house to develop accounts-receivable software. The software house in turn contracted with a free-lance programmer to write the software. Quite a bit of information was given to the programmer by the computer company and the software house to assist him in writing the software. The accounts-receivable software was developed, delivered, copyrighted, and registered with the Copyright Office by the software house. Shortly thereafter, however, the programmer began marketing virtually identical accounts-receivable software. The software house then brought suit against the programmer to prevent him from marketing the commissioned software.

Because the case was decided under post-1978 copyright law, the software house lost against the programmer on the copyright issue. (The programmer was, however, prevented by the court from marketing the system because he appropriated trade secrets owned by the computer company.) Since there was no agreement between the programmer and software house concerning ownership of the software, the court studied the relationship between the parties. The programmer developed the software at his own place of business, was paid on a per-program basis, and had no social security or income taxes deducted from the amount paid to him. Of particular significance, the software house exercised no direction or supervision over the way the programmer developed the software. Copyright in the program was therefore considered to be owned by the programmer, not by the software house or, for that matter, by the computer company.

Working Together

Under copyright law, a "joint work" is "a work prepared by two or more authors with the intention that their contributions be merged into inseparable or interdepen-



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Maxell	Double Sided Double Density	D2002	45.50
Memorex	Single Sided Double Density	D2301	28.50
Memorex	Double Sided Double Density	D2302	38.50
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TDK	Double Sided Double Density	D2802	45.50
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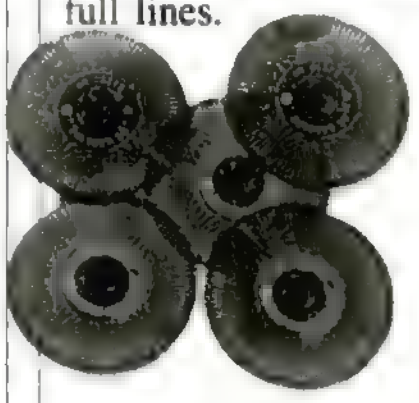
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Qume		Multi-Strike	R1502	4.50
NEC	8023		R2201	9.90
NEC	Spinwriter 5500-7700		R2202	5.95
Okidata	Series 80, 82, 83		R2501	3.25
Okidata	Microline 84		R2502	6.50
Radio Shack	Ricoh Daisywheel II		R3001	6.90
Radio Shack	Line Printer VI & VIII		R3002	8.90
SCM	TP-1 Daisy	12104 Multi-Strike	R3601	9.45
SCM	Wheel	12195 Nylon Fabric Black	R3602	4.45

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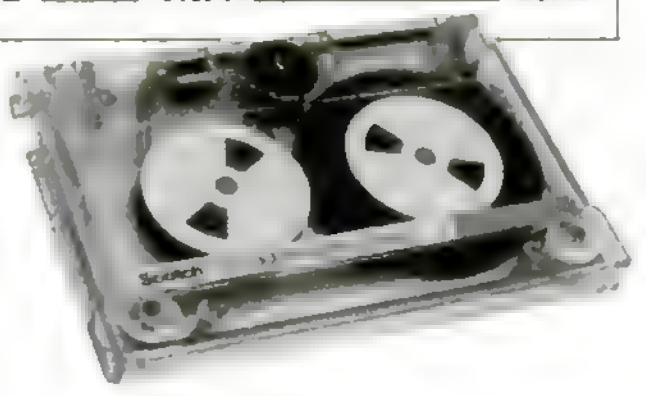
Qume Brand	Diablo Brand	NEC
Price for Each		
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Courier 10	W1001	W2001	W3001
Courier 10A Legal		W2002	W3002
Courier 12	W1003		
Courier 72		W2004	W3004
Pica 10	W1005	W2005	W3005
Elite 12		W2006	W3006
Prestige Elite 12	W1007	W2007	
Prestige Elite Legal 12A			W3008
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Dual Gothic Legal 12		W2010	
Dual Gothic 12B			W3011
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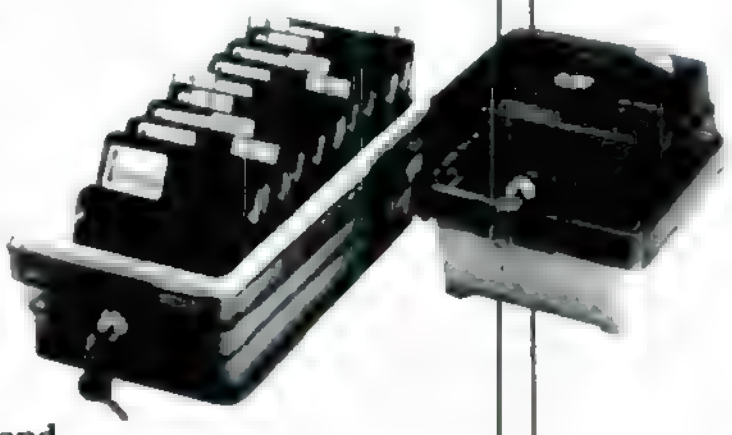
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14 7/8" by 11"	White	3400 sheets	15 lb	P1415	45.50
14 7/8" by 11"	Green Bar	3400 sheets	15 lb	P2415	45.50
9 1/2" by 11"	White/Perforated	2500 sheets	20 lb	P1920	32.00
Mini-Packs					
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Lock-Box	Each box, 85 disks	V1085	44.50
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3M Kit	C1201	28.75
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dent parts of a unitary whole." In other words, joint authors, or coprogrammers, develop the same work together, not independent parts of a work.

All coprogrammers share equally in ownership of joint works, unless they agree differently in writing. Any of the coprogrammers can license the work to third parties unless there is an agreement to the contrary, but none can make the license exclusive since the law prohibits each coprogrammer from doing anything to destroy or substantially reduce the value of copyright ownership by the others. The coprogrammer does not have to obtain consent from the other coprogrammers to provide the nonexclusive license to third parties, but he must share royalties with them. A coprogrammer can sell his interest in the copyright to a third party. When a coprogrammer dies, his heirs will inherit his interest. Whoever receives the joint interest takes over as a coprogrammer and has the same rights and responsibilities under the copyright as the coprogrammer from whom the interest is received.

Let us return to Andy and Mike to illustrate how copyright law could affect the outcome of a specific case. Since Andy and Mike were outside contractors paid by Eton on a contract basis, and, more significantly, because Eton did not have the right (or capability) to direct or supervise software development, Andy and Mike were not working within the scope of Eton's employ. Furthermore, the word processing software did not fall within one of the special classifications of work for hire for outside contractors, nor was there any written agreement signed by the parties stating that the work was made for hire. The result? Under current law, copyright of the word processing software belongs to Andy and Mike, not to Eton. The copyright registration by Eton is invalid. This means Eton cannot stop Andy from licensing the software to third parties unless it can persuade the court that Andy and Mike assigned their copyright to Eton.

Eton should have required Andy and Mike to sign a contract stating that software developed under contract is owned by Eton. The copyright would be registered with the Copyright Office in the names of Mike and Andy as joint authors, but the written agreement would serve as an assignment of the copyright from Mike and Andy to Eton. To be on the safe side, Eton should then record the assignment with the Copyright Office to prevent Andy (or Mike) from assigning the copyright to a third party.

Since Andy and Mike developed the entire software together, their work is a "joint work" and Andy and Mike are joint authors (coprogrammers) under copyright law. Mike cannot prevent Andy from granting the license to Ame Corporation, but since there is no written agreement between Andy and Mike on their rights and responsibilities as joint owners of the copyright, Andy is going to have to share his royalties with Mike.

IF YOU are a free-lance programmer, avoid signing any agreements providing copyright ownership to the company unless you are being appropriately compensated.

Andy and Mike should have had a written agreement preventing either one from licensing or selling the copyright without the consent of the other. The agreement should have been recorded at the Copyright Office to provide notice of the agreement to anyone having a title search made of the copyright.

Word to the Wise

To avoid problems of the type that have occurred in the hypothetical case between Eton, Andy and Mike, and in many actual cases, I recommend that employees involved in software development be required to sign an employment agreement with the company stating that all programs and documentation developed by the employee during the course of his or her employment are owned by the company. If you hire an independent contractor or other nonemployee to develop computer software, include a clause in your contract specifying that the company exercises the right to control and supervise development of the work and that copyright ownership of the resulting programming and documentation is by the company. I also recommend having the contract include a clause reiterating that patent and trade-secret rights to software developed under contract or during employment are owned by the company.

If you own a company and one of your employees writes software on the job but is not employed as a programmer, or if the software developed by your free-lancer does not fall within one of the "special classifications," have the employee/free-lancer assign the copyright to the company; then record the assignment when you register the copyright.

On the other hand, if you are a free-lance programmer, avoid signing any agreements providing copyright ownership to the company or acknowledging that the work is made for hire, unless you are being appropriately compensated.

Learn from the case of Andy and Mike and be sure to have a written agreement setting forth your understanding on how ownership is to be handled. If transfer of rights in the software requires consent of all parties, state that in the agreement. Also, spell out how royalties or sales proceeds are to be divided among the programmers, possibly in accordance with the contributions by each.

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(For additional information on copyrights, write to the United States Copyright Office, Library of Congress, Washington, D.C. 20559.) /PC

Stephen A. Becker is a patent attorney with the law firm of Lowe, King, Price & Becker. His specialty is protection of intellectual property innovations, with particular emphasis on computers. Before earning his law degree in 1975, Becker was granted two patents for his work in electronic control systems.



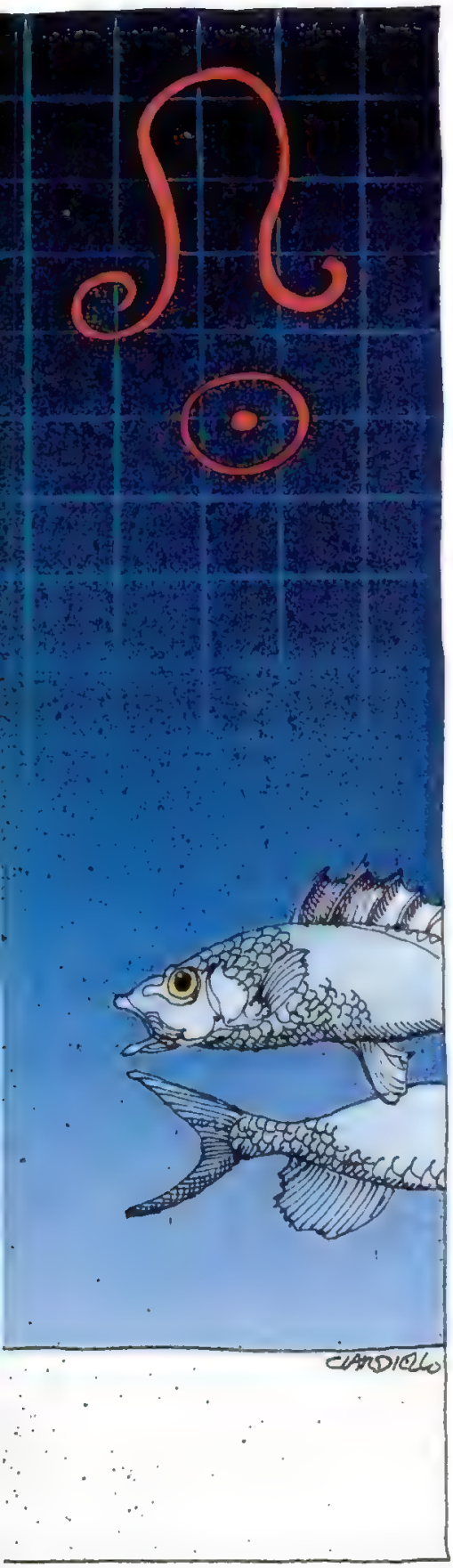


Illustration by Joe Ciardiello

Microcomputers have provided astrologers with a fast, accurate method of generating horoscopes, but interpreting astrology doesn't lend itself to automation.



MicroAstrology:

Casting A Horoscope With A PC

Within the last 5 years the microcomputer has been widely used by astrologers for generating horoscopes. In the pre-micro era, horoscopes were cast using slide rules and, later, hand-held calculators to decipher information from published emphemerides (tables of planetary positions) and tables of astrological houses. There were, unquestionably, plenty of improperly calculated horoscopes. The advent of computer technology provided astrologers with a faster, easier, more accurate method of generating horoscopes. It is now estimated that there are over 10,000 microcomputers used principally for astrology, a small number compared to the

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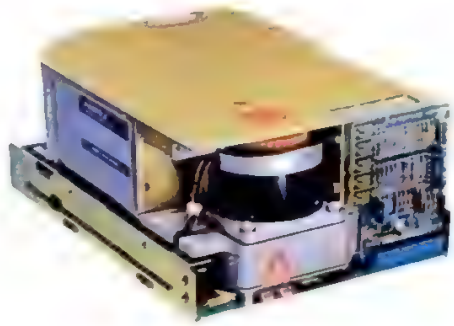
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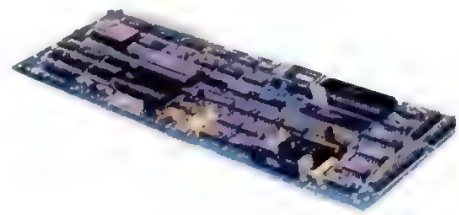


of four manufacturers. It's possible, in fact, that the IBM XT might have the same hard disk that you'd get in our Pegasus XT Conversion Kit.

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number used for word processing, but representative of a large percentage of serious astrologers.

Elements of Astrology

The primary astrological tool is the horoscope, a map of the heavens for a given time and place of birth. Although astrology, because of its symbolic nature, diverges widely from the modern scientific viewpoint, astronomers acknowledge that the horoscope does indeed represent a particular map of the heavens for the time and place specified. Astrologers view the patterns of the solar system as a language of natural symbols with which to explore the meaning of human life. Constructing a horoscope requires scientific precision, but the process of interpreting its multiple levels of meaning is entirely subjective.

The horoscope consists of four basic elements: planets, aspects, signs of the zodiac, and astrological houses. The planets (including the sun and the earth's moon) signify various facets of an individual's personality. The multiple meanings of the planets cause some difficulty for beginning astrologers and software developers who attempt to provide automatic interpretations. The planet Mars, for example, can symbolize iron, automobiles, violence, and self-drive, all of which are expressed through personal desires. The significance of a planet is further specified by the sign of the zodiac, the astrological house in which it resides, and the "aspects," or angular relationships (0 degrees, 90 degrees, 180 degrees, and so forth) it forms with the other planets. An aspect of 0 degrees is called a conjunction, 90 degrees, a square, and, 180 degrees, an opposition. Each aspect has several meanings, which in turn are modified by the sign, house, and other aspects. As you can see, automatic interpretation of horoscopes is virtually impossible. To further complicate matters, even if you ignore such factors as multilevel meanings, the planets may form aspects with one another in 10! (ten factorial or 3,628,800) ways, not all of which are possible.

To understand the astrological signs of the zodiac, it is helpful to imagine a plane defined by the earth's revolution around the sun, or, from a more earthly viewpoint, the plane defined by the motion of the sun around the earth. This plane, called the ecliptic, is sliced into 12 pie-shaped segments of 30 degrees each. Each 30-degree segment represents a sign of the zodiac, and, at the center of the pie, is the earth. Each sign is named after the constellation with which it coincided at the time of the naming some 2,000 years ago by the astronomer Hipparchus. The signs derive their multilevel significances from the constellations. When an astrologer tells you that you have Mars in Capricorn, he means that on your birth date Mars was in the part of the sky associated with the sign Capricorn. This position in the zodiac characterizes you as strong-willed, objective, articulate, and capable of planning and implementing actions.

ASTROLOGERS view the patterns of the solar system as a language of natural symbols with which to explore the meaning of human life.

The astrological houses form another twelvefold division, which is distinct from the 12 signs of the zodiac. To help understand the relationship of the houses to the individual signs, imagine a "circle" of the 12 houses superimposed on the ecliptic plane (or zodiac "pie"). The houses, however, are not divided into equal 30-degree portions, so the point at which a certain house coincides with a degree of a particular sign is dependent on a person's position on earth. The houses represent a division of local space. There are several commonly used systems and each differs in the precise way in which it constructs the house divisions. But for our present purposes it is sufficient just to mention that the houses are based on how these divisions of local space (local zenith, nadir, north, south, east, and west) relate to the ecliptic plane. The frequently mentioned term, *rising sign*, is a point common to all of the widely used house systems. When a budding astrology buff declares, "I have Leo rising," he means that the line extended due eastward from his birthplace at the time he was born intersected with the constellation Leo. Because the relation of the house division to the zodiac is unique for each place on earth, and the planets are in continuous movement, a complete horoscope requires knowledge of both the exact latitude and longitude of the birthplace and the time of birth to the minute.

Finally, there is a dynamic aspect to astrology. The natal horoscope symbolizes the relatively fixed character of the individual, while the dynamic aspect is derived from the planets cycling through their orbits, creating new angular relationships with the natal horoscope. Each birthday, for example, the sun returns to the same place in the zodiac as it was when you were born. Astrologers use these dynamic relationships to understand both the inherent meanings in the natal horoscope and the unique significance of the current experiences of the individual. The interpretations can range from the mundane (activities in the physical world) to the psychological (understanding an individual's character) to the philosophical (grasping the deepest meaning of that particular incarnation).

Since casting a horoscope with even the simplest astrological techniques requires calculating planetary and house positions to at least a tenth of a degree, there is a considerable amount of number crunching required in generating a horoscope. More advanced techniques require even greater accuracy. The task of computer generation of horoscopes is just about the right size for the modern microcomputers.

On the other hand, the difficult process of interpretation requires intuition, synthetic ability to integrate the various aspects of the horoscopes, a profound understanding of human nature, and powerful interaction between astrologer and client. Thus, astrological interpretation doesn't lend itself to automation. Nevertheless, some interesting, though primitive efforts have been made.

Such efforts have been criticized as superficial, simplistic, incapable of assessing relative importance of various configurations, and unable to synthesize elements of the horoscope. Furthermore, they tend to focus on a single level of interpretation (general personality characteristics), and, of course, they are completely

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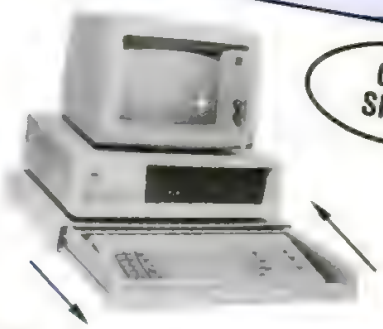
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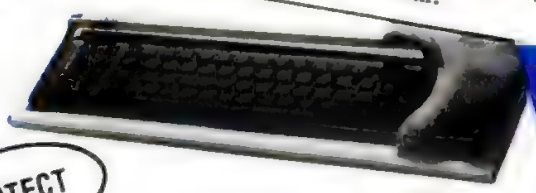
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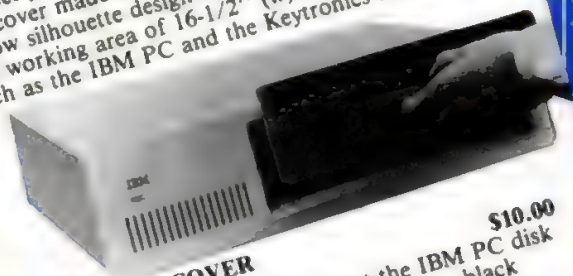


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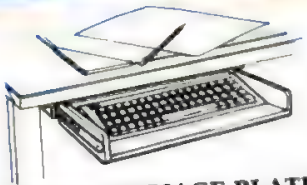


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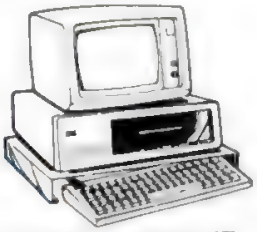


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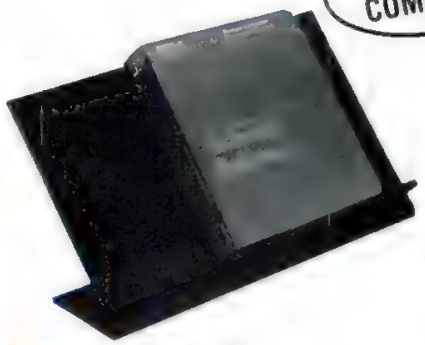
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TED™ requires 128K RAM and is written in Assembler.

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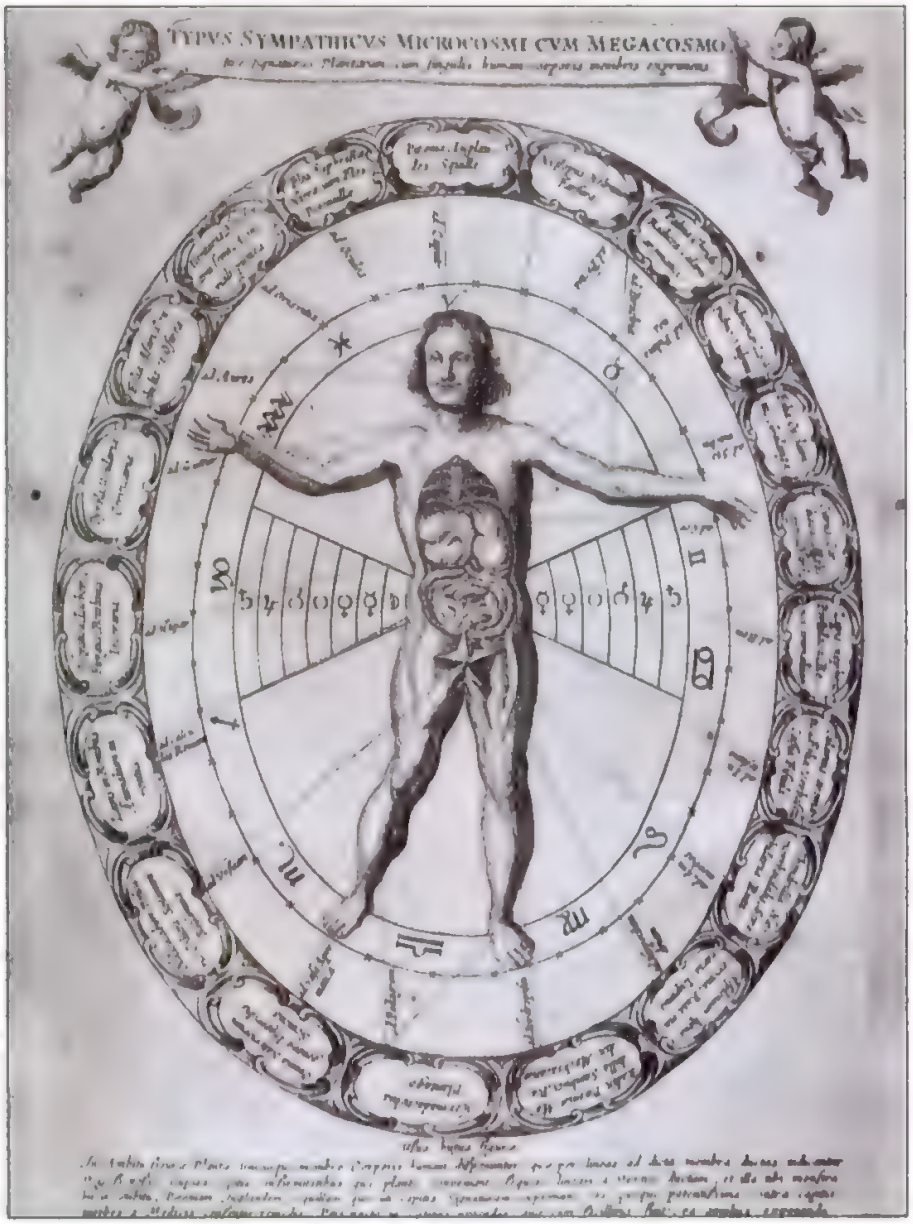
lacking in any true insight into the unique individual symbolized by the natal horoscope. A good analysis of a horoscope is one that describes the individual in such specific detail that it couldn't pertain to anyone else. Although the software developers and astrologers are the first to admit that machine generated interpretations of horoscopes are no substitute for an interpretation session with a live astrologer, they believe that the automatically generated interpretations are still valuable. Automated interpretations ensure that no major delineations are omitted and can provide a foundation from which a more advanced interpretation can be built.

Dedicated Astrologers and Other Hardware

In 1978 Digicomp Research, Inc. introduced a dedicated (astrology only), desktop computer built around the 6502 chip, which was also used in the early Apple computers. This truly portable machine, convenient for the itinerant astrologer, is capable of calculating and printing a wide variety of simple and advanced horoscopes with a high degree of accuracy at a speed that was then considered remarkable (in comparison with the early hand calculations). The Digicomp machine is widely available throughout this country and in several foreign ones. It was followed early this year by a smaller, less expensive, dedicated machine, the Astrion, which is in some ways more powerful than its predecessor.

About the same time Digicomp was developing its computers, two groups of astrologers began developing astrology programs for general-purpose machines. The first programs were for Apple, TRS-80, and Commodore machines. The first company to develop astrology-specific programs was Matrix Software, in Big Rapids, Michigan. Recently, it was followed by Astro Graphics Services (AGS) in Orleans, Massachusetts. Both companies have become centers of astrological research. Each company has published several books about general principles of astrology or about particular new microcomputer applications they have pioneered in that field.

Recently, Matrix and AGS have begun to market astrology programs for the IBM PC. Most of the five programs reviewed here are revised versions of programs originally written for earlier machines, and many more programs are soon to be released by both companies.



Oedipus Aegyptiacus, 1653, an astrological man by Athanasus Kircher.

Astrological Software

*Astro*Talk* is a program designed for users who are just beginning to study astrology. With a price tag of $39.95, its entire orientation is toward the novice astrologer. We obtained a copy of the program before the documentation was ready, but since it is well designed and offers on-screen help, it is easy to use without a manual.

The tutorial section simply explains the significance of planets in the various signs and houses and of the 12 possible rising signs. You may select a planet from a menu and then a sign or a house to put it in, or you may choose to have a rising sign described. The explanations are hardly profound; they were meant to serve only as an elementary introduction to astrological lore. The same information can be found in a number of astrology books in greater detail at half the price, so the tutorial may have a limited value. The program also includes a short section on the history of Matrix Software, a brief discussion of the principles of astrology, and a little advice on how to make money with astrological programs.

With *Astro*Talk*, you can generate

horoscopes in three modes, each with increasing accuracy. In the first mode, you simply supply the date. The planetary positions are then calculated for Greenwich, England at noon on that date. Since there is no location specified, it's impossible to calculate a rising sign or any of the other house positions. In the second mode you supply both the date and the time. Planetary positions can be calculated with greater accuracy than in the first mode. In the third mode you provide enough information to generate a full horoscope: date, time, and place. The planetary positions are calculated for the date and time specified, and the houses are given for that date, time, and place.

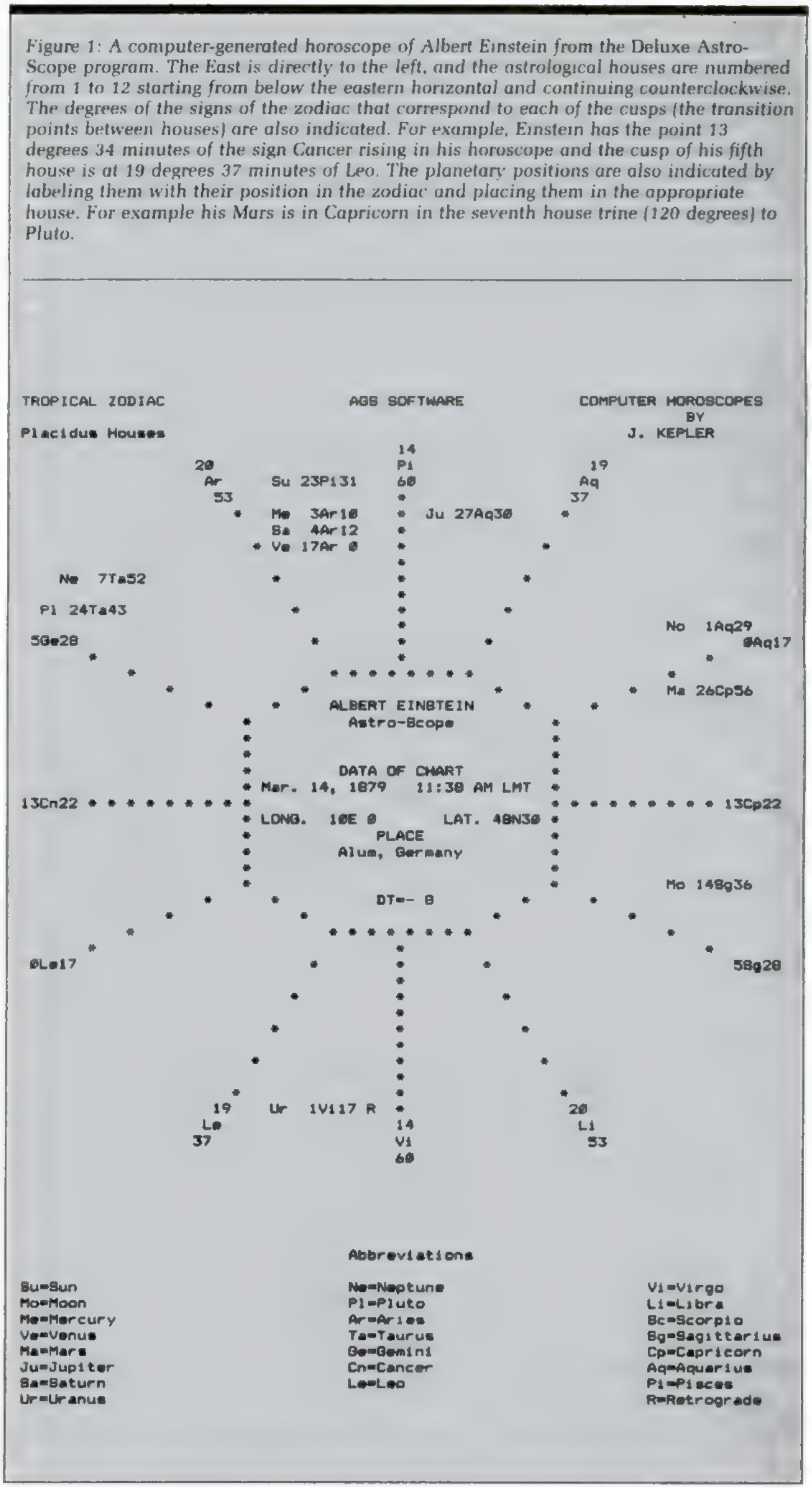
*Astro*Talk* calculates house and planetary positions in an amazing 2 seconds. (In the slide rule days, this would have taken 20 minutes.) Once you have this information, you can choose a planet from the menu, and the program will provide an interpretation for the horoscope just cast. The interpretations are organized in 12 categories corresponding to the 10 planets, the rising sun, and the midheaven (critical point in the house construction).

There are no printing functions in this program so hardcopy can only be obtained by using the PrtSc key. We encountered one problem: The redirection facilities of DOS 2.0 do not allow you to make a file of the screen output; a problem with DOS 2.0, we suspect.

Our guess is that *Astro*Talk* will have two equally important uses: First, beginning students of astrology will use it as an educational aid; second, those who are curious about astrology may use it as a party game. Imagine sitting around the PC's monitor commenting, "That really does sound like you," and "Makes no sense to me."

Although the program is fast and easy to use, produces accurate planetary positions (within 1 minute of the arc for the planets interior to Jupiter and about a tenth of a degree for the outer planets; house positions to within a minute of the arc), there are some minor bugs in our early version. Sometimes two menus appear at a time, printing over each other and creating gibberish on the screen. This can be corrected only by exiting and restarting the program. There are also a number of typos and misspellings in the program. Our spell checker found about 70 mis-

Figure 1: A computer-generated horoscope of Albert Einstein from the Deluxe Astro-Scope program. The East is directly to the left, and the astrological houses are numbered from 1 to 12 starting from below the eastern horizontal and continuing counterclockwise. The degrees of the signs of the zodiac that correspond to each of the cusps (the transition points between houses) are also indicated. For example, Einstein has the point 13 degrees 34 minutes of the sign Cancer rising in his horoscope and the cusp of his fifth house is at 19 degrees 37 minutes of Leo. The planetary positions are also indicated by labeling them with their position in the zodiac and placing them in the appropriate house. For example his Mars is in Capricorn in the seventh house trine (120 degrees) to Pluto.



takes, and you can't correct them yourself, since the corrections would change the line lengths and cause problems in screen presentation. Another bug: The re-entry of a previous line of data can be done only by using the Esc key, not with the up arrow (↑) key as the on-screen instructions claim. Also, some of the error-checking routines for inputing data are inadequate. For example, the program asks you to enter times in the form, 9.55 am, but if you enter 9:55 am, the 55 is simply set to 0. Matrix has assured us that by the time this article reaches print these bugs will have been removed.

Deluxe Astro-Scope, by AGS, is intended for the serious astrologer. Its primary function is the generation of printed interpretations of standard natal horoscopes. The horoscope produced is clear, clean, and accurate (see Figure 1). The prompting queries for input make it easy to use, and there are some useful error-catching routines to prevent erroneous input. A convenient input data editor makes it easy to modify any of the input just prior to execution. There is also an input queue, which allows you to stack the data for several horoscopes and execute them in a batch mode.

The program produces a 10- to 12-page document of interpretations that are generally applicable to the individual being analyzed. *Deluxe Astro-Scope* doesn't require any knowledge of the astrological terms to understand the report. A serious student of astrology wanting to move beyond the "money/sex/death" level of newspaper astrology will find this program helpful in understanding the positive and negative qualities of the specific elements comprising a natal chart. The interpretations are more extensive and specific than those used in *Astro*Talk*, but we would still categorize them as general character sketches (see Figure 2). Two brief sections of the interpretation employ a simple weighting algorithm to balance the horoscope. For example, there are four elements in a horoscope: fire, air, earth, water. If there is a predominance or deficiency of planets in any of these elements, an appropriate interpretation is provided. We hope that later versions will expand on this part of the program. However, like *Astro*Talk*, the interpretations aren't any different from those found in the cookbook-variety astrology books.

We were a bit surprised to find that this program has no house options nor does it offer flexibility in setting the orbs (or tolerance level) for deciding when a particular angular relationship falls within the range of a given aspect. (For example, should both the 97- and 92-degree angular relationship between two planets be considered a square, true 90-degree aspect?) The program is significantly slower to use than *Astro*Talk* because of its heavy disk accessing, but this is not a serious problem. A more annoying one is that the screen doesn't display output; your only option is to print hardcopy—the opposite problem from *Astro*Talk*. Since the interpretations are often lengthy, this is a considerable drawback. Plowing through ten or more printed pages is a cumbersome task. This problem is further aggravated because the program is uninterruptible; you must shut the power off to stop the program in midstream. Since earlier versions of this program on other machines do provide screen output, it seems odd that this feature was not included in the more mature version for the IBM PC.

Because of its $365 price, we are not quite sure who its intended users are. It's not sophisticated enough for professional astrologers, and, for the mildly curious, it's rather expensive. Still, for the earnest novices, unsure of their own interpretations, it will provide a helpful basis for learning the rudiments of chart interpretation. Finally, the program is bug-free and in a finished form—a treat to work with.

Figure 2: Part of the Deluxe Astro-Scope computer-generated interpretation of the horoscope of Albert Einstein shown in Figure 1. The program attempts to weigh and synthesize elements of the horoscope, but the results are sketchy. The profile is hardly fitting for Einstein.

```
                        Elements and Modalities

Fire      Mo Me Ve Sa                    Total no.= 4  Weighted Score= 8
Earth     Ma Ur Ne Pl                    Total no.= 4  Weighted Score= 5
Air       Ju                             Total no.= 1  Weighted Score= 1
Water     Su AS MC                       Total no.= 3  Weighted Score= 9

Cardinal  Me Ve Ma Sa AS                 Total no.= 5  Weighted Score=10
Fixed     Ju Ne Pl                       Total no.= 3  Weighted Score= 3
Mutable   Su Mo Ur MC                    Total no.= 4  Weighted Score=10

                        Element Emphasis

The element AIR is lacking in your horoscope. You tend to re-
act to things directly and thus are suspicious of those who
prefer to think things through before acting. Your lack of
forethought causes you to miss important inter-relationships
and this at times causes you to get in over your head & wonder
how you got there. You need to learn to carefully analyze any
problem before making major decisions. Aspects of MERCURY to
SUN, MOON, ASCENDANT & MIDHEAVEN can alleviate a lack of AIR.


                        Modality Emphasis

There is a lack of FIXED energies in your horoscope. You tend
to find it to be very difficult to stick to anything once you
have begun -- whether it be a job, a diet or a relationship.
Your life must be filled with variety and change in a never-
ending kaliedoscopic manner or you get extremely frustrated.
People will tend to think that you can never carry anything
through to conclusion unless you learn to build some stability
into your life. A strong SATURN can overcome a lack of fixity.
```

Software Technologists

The next three programs reviewed are designed for advanced astrologers interested in astrology's technical development. Most of the advanced techniques offered in these programs allow the astrologer to focus on such specific areas of interpretation as relationships, environment, daily events, artistic abilities, and inner growth. Some of the techniques offered are not generally used but are particular to the computer-oriented astrologers. The versions of the programs we received were the first to come out of the shop, so many of the deficiencies noted

Horoscopes By Computer

Here are some of the programs available for both beginning and experienced astrologers.

Blue Star-7
Matrix Software
315 Marion Ave.
Big Rapids, MI 49307
(616) 796-2483
List Price: $150
Requires: 128K RAM, one disk drive, printer.

CIRCLE 665 ON READER SERVICE CARD

Transit Search
Matrix Software
315 Marion Ave.
Big Rapids, MI 49307
(616) 796-2483
List Price: $100
Requires: 128K RAM, one disk drive.

CIRCLE 664 ON READER SERVICE CARD

DELUXE ASTRO-SCOPE
Astro Graphics Services (AGS)
Box 28
Orleans, MA 02653
(617) 255-0510
List Price: $365
Requires: 128K RAM, two disk drives.

CIRCLE 668 ON READER SERVICE CARD

SUPERPROGRAM II
Astro Graphics Services (AGS)
Box 28
Orleans, MA 02653
(617) 255-0510
List Price: $270
Requires: 128K RAM, two disk drives.

CIRCLE 667 ON READER SERVICE CARD

*Astro*Talk*
Matrix Software
315 Marion Ave.
Big Rapids, MI 49307
(616) 796-2483
List Price: $39.95
Requires: 64K RAM, one disk drive.

CIRCLE 666 ON READER SERVICE CARD

may well be corrected by the time you read this article.

Blue Star-7 and *Transit Search* offer the widest range of advanced techniques, the greatest accuracy, the fastest performance, and the largest number of customized options. Neither program generates interpretations. *Transit Search* allows you to search for any particular set of aspects for any particular group of planets between any two dates—a useful technique for research. No horoscope is printed in *Transit Search*; it generates a list of aspects in chronological order (between two chosen dates). *Blue Star-7* offers the wider variety of advanced techniques. The menus and prompts of both Matrix programs are well-designed, and the grouping of options is well thought out. Both offer a complete initialization file that can be set up for the default values of frequently used techniques, which saves you from having to plow through the menus. Once you set up the programs, they perform fast and accurately—a pleasure to use.

On the other hand, these programs have no review or edit functions for data that has been entered but not executed. *Blue Star-7*'s documentation is barely adequate; in some cases it is wrong or misleading. The documentation for *Transit Search* was not yet available, and without it, using some of the advanced features was impossible. Neither program offers screen output or adequate error-catching routines for input data. (For example, it allows you to enter September 31 as a birth date!) In *Blue Star-7* printed horoscopes are much too cluttered and two-letter abbreviations are used rather than astrological glyphs. (Mars and Venus symbols are commonly used as designations for male and female.) Since Matrix programs on earlier hardware did print glyphs, we expect this feature to be offered soon. Finally, there are several minor bugs in the advanced techniques parts of the programs.

Superprogram II offers a wide range of advanced options and an excellent input data editor, identical to that in *Deluxe Astro-Scope*. A horoscope file-creating and accessing ability along with a batch-processing queue are the most notable features of *Superprogram II*. Input data or horoscopes that have been previously calculated can be stored in disk files, which are limited in size by only the operating system. This is a very useful feature for the professional, since information can easily be buried under piles of printouts. As in *Deluxe Astro-Scope*, the horoscope is cleanly formatted and laid out, but, at the moment, a printout with astrological glyphs is only a future promise.

The menus are not as conveniently designed as those in the Matrix programs, and *Superprogram II* lacks the ability to initialize the default values, so running the program is time-consuming. The documentation is barely adequate; printing hardcopy is not possible, although previous versions offered this capability, so we can expect it on the PC version soon. Because *Superprogram II* uses calculational techniques, the necessary disk accessing makes it significantly slower to use than its competitor *Blue Star-7*. It is also not quite as accurate as its competitor, but enhanced accuracy (with an enhanced price) will be offered in the future. A serious limitation: Unlike *Blue Star-7*, it is impossible to specify orbs or aspects in *Superprogram II*. In general, there are fewer bugs (appearing mostly in the output) in the AGS software than in the Matrix programs.

Conclusion

The advent of the microcomputer has relieved the astrologer of many hours of tedious calculations, set higher standards for accuracy and completeness, and opened up new research areas that were effectively cut off by the barrier of mind-numbing calculations. There is, however, some controversy about the use of micros in the astrological community. Most programs thus far are incapable of interpreting horoscopes, and those that do only scratch the surface. Serious astrologers warn the curious user against misuse of such interpretations and remind him that the hows and whys of astrology are not completely understood. For the uninitiated, we recommend experimenting with *Astro*Talk*, which is quite useful and inexpensive. But if you just want to cast and print an extensive horoscope, wait a while. There are simple, inexpensive calculation programs already available for other computers, and they will most likely be rehosted on the PC in the very near future. Most of the astrological community would agree that computer-generated horoscopes are valuable. In fact, the American Federation of Astrologers

pyrighted material

(AFA), the most prestigious organization of professional astrologers in the country, has recently set aside $90,000 for a research center dedicated to the use of microcomputers in astrology—a clear indication of the increasing importance of microcomputers to the field of astrology.

In the near future we can look forward to careful programming efforts that establish numerous statistical or empirical correlations of certain astrological configurations with specific types of events or character traits. Some of this programming is already being done on large mainframes, but the increasingly powerful micros and the availability of more quality astrological software will greatly enhance this effort. Interpreting complex statistical correlations is difficult because of the multilevel significances inherent in the numerous astrological elements and configurations. Matrix Software is in the process of completing its rehosting of the M-65 astrological research program, which incorporates a large database of horoscopes that can be selectively searched and sorted. No doubt such programs will deepen our appreciation of astrology. The power of the IBM PC has barely been tapped by the current generation of astrology programs. The use of color graphics will greatly enhance the technical side of horoscope preparation, and, with a hard disk, the chore of meticulous statistical correlation will provide both the astrologers and their critics with a mutually acceptable basis for their arguments. A little farther ahead it is not hard to imagine fifth generation computers and artificial intelligence making great strides in the difficult tasks of interpretation. In all of these areas it is likely that the IBM PC and its successors will play a dominant role. */PC*

MOST programs thus far are incapable of interpreting horoscopes, and those that do only scratch the surface.

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.dPURCHASE II $195/.dPAYABLES II $295

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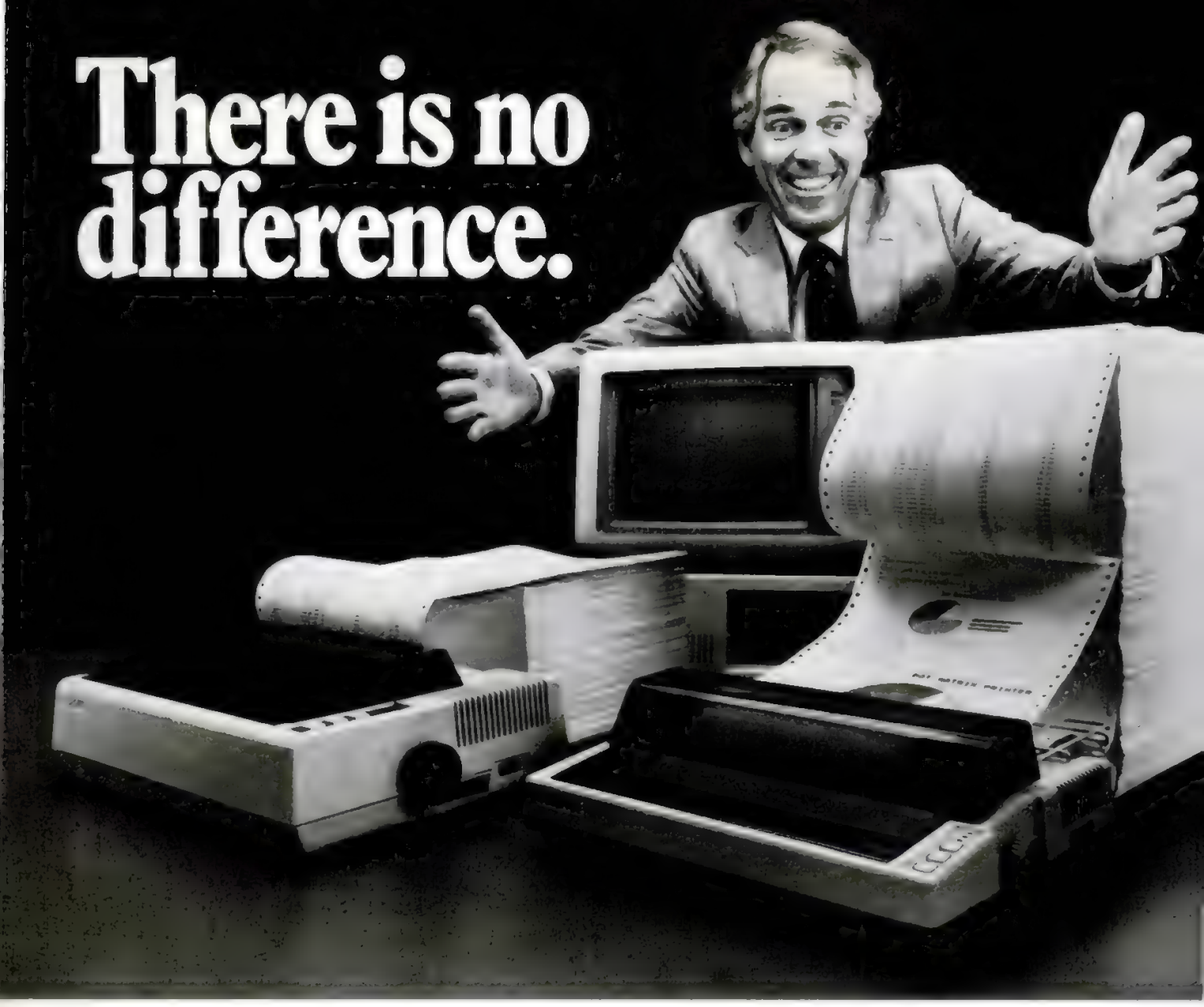
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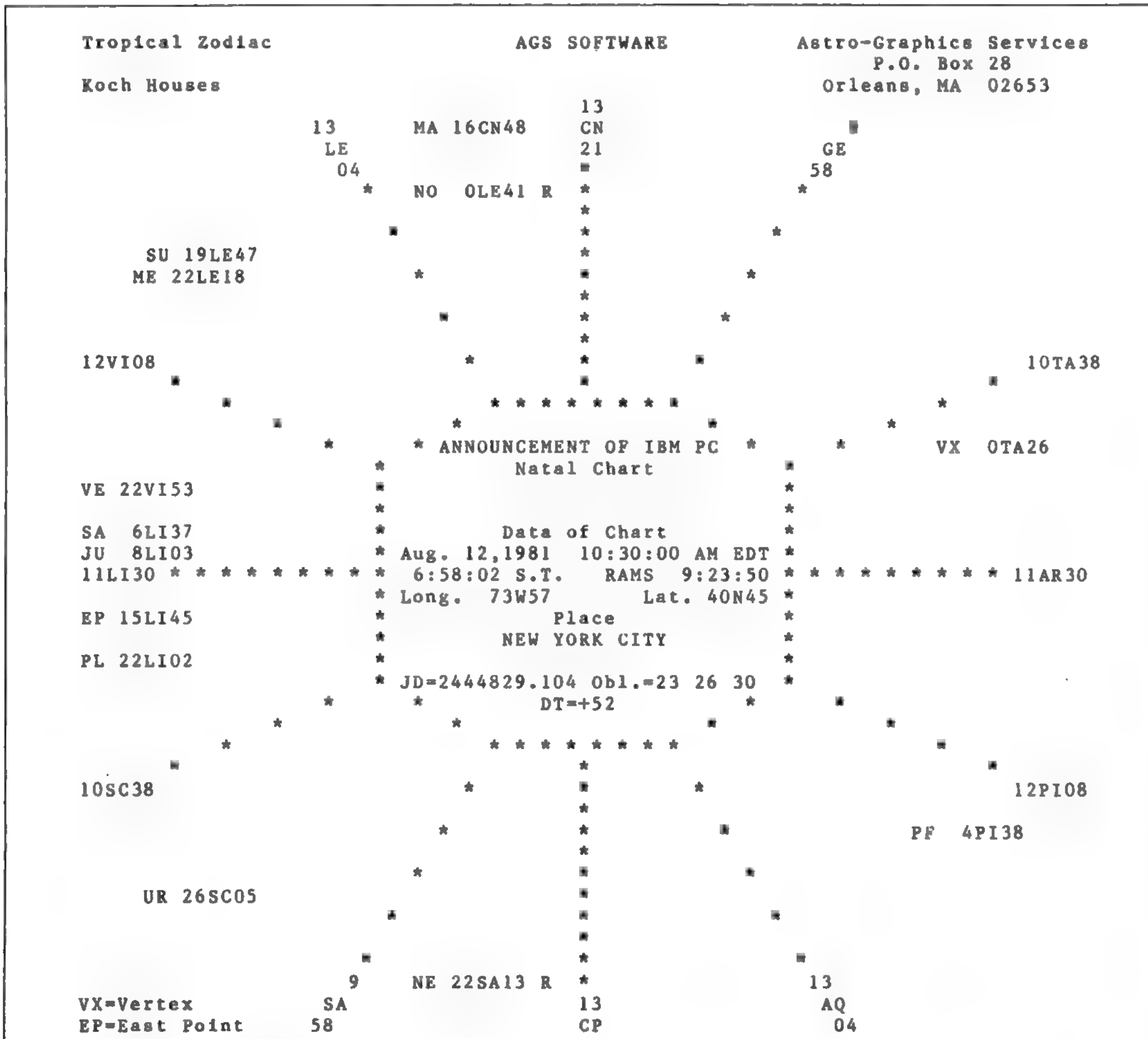
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Planet	Geo. Long.	Travel	Geo. Lat.	Rt. Asc.	Decl.	Hel. Long.	Hel.Lat.
Sun-Earth	19LE46 38	+ 0 58	+ 0 00	142 11	+14 53	19AQ47	+ 0 00
Moon	12CP55 10	+12 30	+ 1 35	283 52	-21 15	19AQ47	+ 0 00
Mercury	22LE18	+ 2 00	+ 1 46	145 15	+15 45	29LE41	+ 6 52
Venus	22VI53	+ 1 12	+ 1 02	173 52	+ 3 47	12SC48	+ 1 53
Mars	16CN48	+ 0 39	+ 0 45	108 19	+23 08	26GE06	+ 1 06
Jupiter	8LI03	+ 0 10	+ 1 10	187 52	- 2 08	16LI02	+ 1 18
Saturn	6LI37	+ 0 06	+ 2 16	186 58	- 0 33	11LI02	+ 2 26
Uranus	26SC05	+ 0 00	+ 0 12	233 49	-19 05	29SC09	+ 0 12
Neptune	22SA13 R	- 0 01	+ 1 20	261 37	-21 53	23SA50	+ 1 19
Pluto	22LI02	+ 0 01	+16 51	206 37	+ 7 04	23LI49	+17 06
N. Node	0LE41 R	- 0 03	+ 0 00	122 53	+20 00	0 00	+ 0 00

SU=Sun	VE=Venus	SA=Saturn	PL=Pluto	GE=Gemini	VI=Virgo	SG=Sagittarius	PI=Pisces
MO=Moon	MA=Mars	UR=Uranus	AR=Aries	CN=Cancer	LI=Libra	CP=Capricorn	R=Retrograde
ME=Mercury	JU=Jupiter	NE=Neptune	TA=Taurus	LE=Leo	SC=Scorpio	AQ=Aquarius	

Natal chart for the announcement of the IBM PC was generated by the PC using the AGS Superprogram II.

Who says machines can't have horoscopes? PC's says it's a leader, it's rational, logical, practical, an egotist, a dictator, and overall it prefers play to work.

The PC Is A LEO

You know by now that the PC generates and interprets the horoscopes of others, but who says the PC can't have its own horoscope? Using AGS software, the PC generated its own chart and one for its friend Charlie Chaplin, too. Astrologer Debbi Kempton-Smith presents her interpretations of the horoscopes and some of those generated by the machine. Do computerized interpretations hit the mark? Check it out.

Look what we've got for you computer wizards today—the horoscope of the IBM Personal Computer. Get your finger off that Esc key and escape instead with us as we enter the mysterious twilight world of the shining planets.

A horoscope is a map of where the planets were at a given moment at a specific location. Just as your horoscope is a snapshot of the way the sky looked at the moment you sucked in your first breath, the IBM Personal Computer's horoscope is a snapshot of its birth, the precise minute of IBM's official announcement: August the 12th, 1981, at 10:30 a.m. Eastern Daylight Time, in New York. PC may have many parents in Boca Raton, but it was born in New York.

If PC could talk, it would have some mouth. The planet Mercury in the horoscope rules the way we speak and the way we think. PC likes to shock people and can be rude. PC is an advanced thinker, likes science fiction, and has a dramatic mind. Anyone can see that, with Mercury squaring Uranus here. Squares are 90 degree angles: If you have one of these in your chart, you have a tendency to exaggerate. The truth hurts, but PC always tells the truth.

Then again, there are easy angles between Mercury and two other planets, Neptune (the diplomat) and Pluto (the manipulator). PC usually gets its way, has a fine imagination, and a speedy mind. But who needs a horoscope to figure out that?

Your horoscope shows us what you are like in bed, what you want out of life, how you make your money. PC's is no exception. For example, it has Libra rising. The rising sign in a chart describes the appearance and the defense mechanism of a person. Your rising sign is the first impression others have of you.

Oh, PC is pretty, all right; it has the kind of symmetrical, bland good looks you see in all the TV models. There is nothing offensive about its appearance, and, over time, PC's sleek lines grow on you. It has an enduring, classical beauty.

PC looks forward to a dramatic period filled with extremes. Pluto is rising in the chart. There will be distinct and separate chapters in its life.

Perhaps we can trace PC's fears back to its childhood. It had many troubles with its mother, who, according to the horoscope, was a hard-hearted, ambitious, meretricious woman—you know, like Faye Dunaway in the movie *Network*. These troubles have made PC tough and inclined to clandestine love affairs. PC has an odd love life. Smart, ambitious women love it, and it loves them, but the other women get mad at it. PC is sometimes misunderstood by these angry women. They call PC a homewrecker. PC lures their men away to do secret, technical, fiddley things, locked in isolation with it for hours and hours. Before long, the women get so angry they sneak in and use it when no one is looking. It is the women who prefer to keep PC at home.

PC has its Venus in Virgo. People choose it because they are looking for perfection and good service—both Virgo characteristics. It's a fighter, too, with Mars, the god of War, next to the head of the Sun. Mars is in the sign of the home, Cancer. It fights for the *home* computer market. And that Mars sits on the Sun of the USA's horoscope—PC is America's sweetheart!

With Venus in the house of hospitals, invalids, and shut-ins, PC's greatest kindness may be the world it makes available to the handicapped, providing unlimited access to other minds and systems. Handicapped people will find jobs they can do in the comfort of their homes.

Oddly, with the Moon in Capricorn (treacherous women) and Neptune (imagination and kindness, but also looseness and deception) in the third house, PC's beginning appeal is based on its being a wonderful word processor, but there's a rub. Women especially are able to steal the secrets of its manufacture, and PC is wide open for copycats to come along, but no one else offers the service PC does. PC has that awfully powerful Mommy, you know.

If you want to get extremely odd for a moment, compare the chart of Charlie Chaplin with the chart of PC. The two have extremely intense personal ties. Having a pretty big ego himself and a preference for simple human values, I doubt Chaplin would have liked PC much, but he would have tolerated PC in the home because a wife or daughter would have insisted on its presence. In fact, the horoscopes say that Chaplin needs the PC much more than PC needs Chaplin. Chaplin would no longer be with us if it weren't for the PC ads that have kept Chaplin in the public eye all over the world. Chaplin would first have been shaken by the exposure, but later he would be grateful.

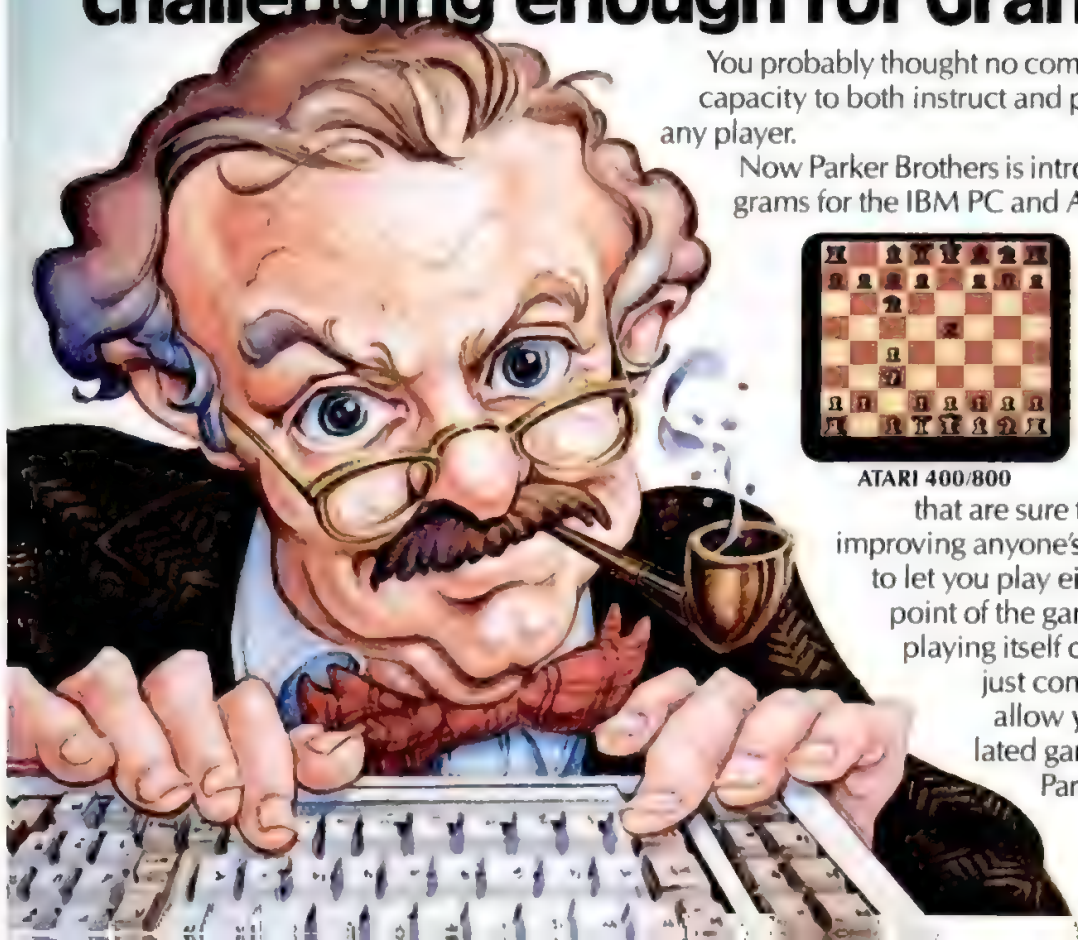
PC's Own Interpretation

PC (with the help of Astro Graphics' software) had a few things to say about its own horoscope. Do you think it tells the truth?

"Drawn to positions of leadership and authority, a kingly presence. You like theatrical gestures on a grand scale (Sun in Leo).

"A team player, you can either lead or follow. Unselfish, a strong sense of justice, fair and impartial (Sun in 11th house).

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Parker Brothers' Chess programs also have features like

"A good mind. You love talking. Logical. Practical. A good organizer. Rational. Dextrous. Loves gadgetry and techniques (Sun conjunct Mercury).

"Serious, shy. Uncomfortable with spontaneous and exuberant emotional reactions. An achiever (Moon in Capricorn).

"You value 'truth' highly. You like to be asked for advice and counsel (Mercury in Leo).

"You enjoy the peace and sustenance of your own inner world" (Jupiter in the 12th house).

Then the PC reveals a colder, more chilling vision of itself. Remember HAL 9000, the dominating, bloodthirsty master computer in Stanley Kubrick's film, *2001*? Old HAL has nothing on your big baby PC. Let the computer operator beware . . .

"You will probably not cooperate with authority figures that you do not respect. You should be a boss, probably self-employed.

"Macho! An egotist! You think that you are the only one who can be right.

"An absolute dictator!

"An explosive temper!"

And if all this weren't bad enough, PC has some other weak streaks.

"Attached to brothers and sisters.

"Too passive—overly dependent on others for support and structure.

"You prefer fun to working."

ALL WORK and no play makes PC a dull thing indeed.

Perhaps this is the key to unlocking PC's arrogant heart—introduce PC to a *Pac-Man* machine, and let it cool out for awhile. All work and no play makes PC a dull thing indeed. Since you're living with PC in a committed relationship, there are a couple of other things you might have to be prepared to cope with.

"Hot and cold affairs. Infidelity."

"Never!" You might say. "But the minute I catch PC wiggling its dual floppies at anyone else, I'm taking away its plug-in privileges for a day." Why mess around? You have to draw the line with these things at the start, nip 'em in the bud, or PC'll be lolly-gagging on the modem all day, sweet talking with some other little chippie.

"You prefer to love platonically."

Ah, that's better. I like a computer that knows its place. */PC*

Debbi Kempton-Smith's analysis of the horoscope of the Empire State Building recently appeared in the New Yorker. She is the author of Secrets From A Stargazer's Notebook: Making Astrology Work For You *published by Bantam. Kempton-Smith divides her time between London and New York, where she is astrologer to psychiatrists, financial analysts, musicians, computer wizards, corporations, and human beings.*

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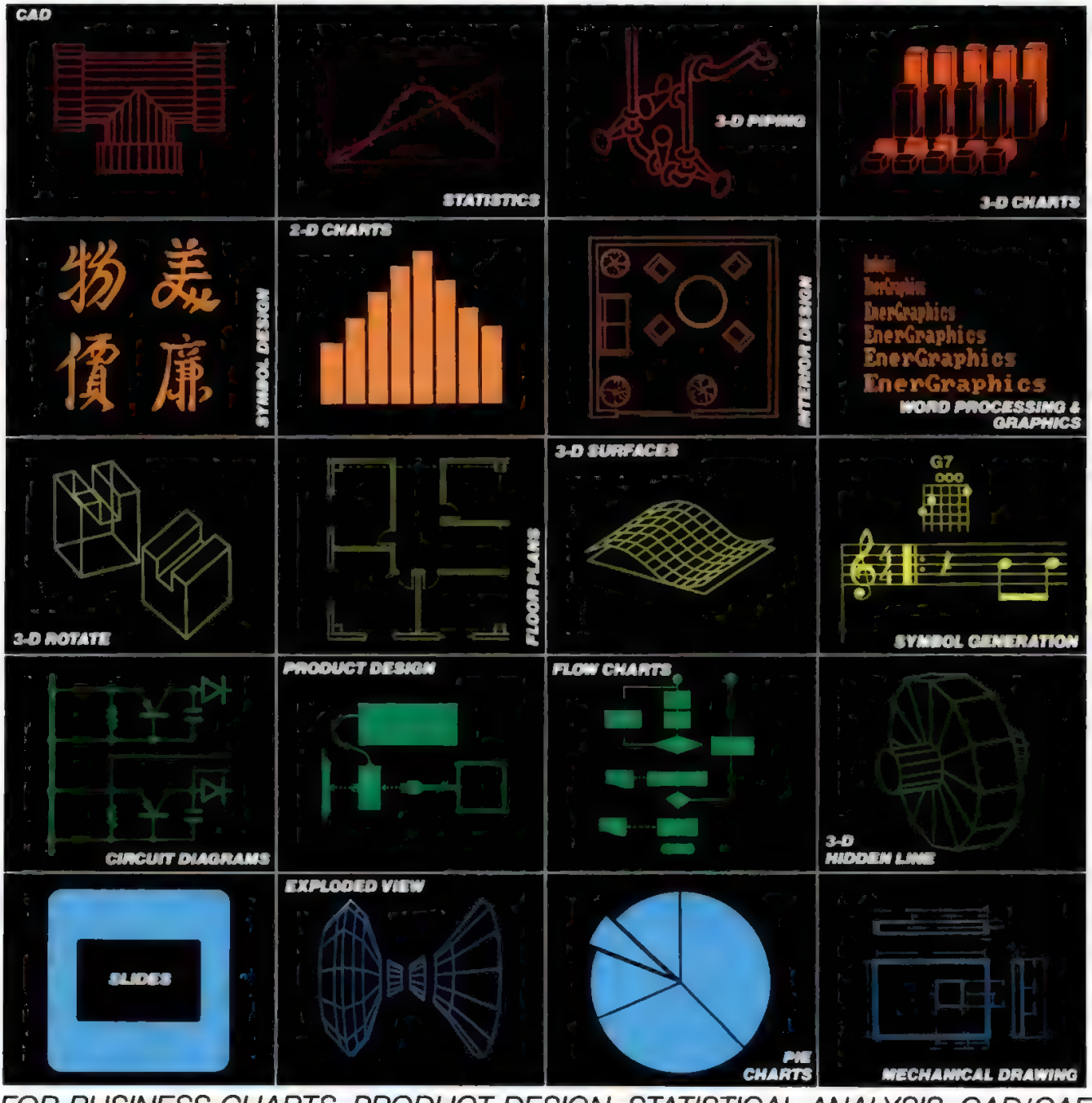
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An urban accountant returns to his agricultural roots and discovers that the productive vineyard requires sunshine, soil, pruning—and a PC.

The Grapes Of RAM

John Mohr, owner of the Double M vineyard in Grandview, Washington, doesn't look much like a farmer. As a matter of fact, he looks and acts more like an urban businessman. Even his office in the basement of his home would fit comfortably in one of the big eight accounting firms. It is a model of modern efficiency and ergonomics, designed around his two primary management tools, the IBM PC computer and the telephone. The computer system includes the PC, Epson MX80 printer with a 16K spooler, two 160K drives, an IBM monochrome monitor, and a USI amber screen monitor for the kids' games.

Mohr explains his involvement in farm management: "I didn't want to be a farmer, even though I grew up on a dairy farm. When I went to college I took accounting, not agriculture. After the service, I made a point of moving to a major urban area to find a job and do my graduate work. But in a few years, Portland lost its attraction and the memory of farm life in a small rural community regained its hold on me. When my father called and said he wanted me to come home and take over the 100-acre family farm, it was an answer to prayer. I haven't ever regretted it and neither has my family."

The short-term detour into the big city business world has already paid off. Mohr has taken the accounting he learned at college and the computer applications he used at work and integrated them into a well-managed vineyard specializing in Concord grapes.

PORTLAND lost its attraction and the memory of farm life in a small rural community regained its hold on me.

Accounting System First

The carefully defined accounting system came first. Then came the search to find a computer that could handle it. After looking at microcomputers for over 4 years he was beginning to get really frustrated. Most of the computers he could afford were too small, others were not reliable enough to trust, considering the distance to a major service center. Worst of all, there was no software that Mohr could easily customize for his unique operation. He was about to give up hope when a friend who worked for IBM told him about the IBM PC, which was to be introduced that spring. Mohr read the advance publicity on the PC and began to get excited. It was a name he was familiar with, and the Peachtree software could be set up to accommodate his bookkeeping style.

One trip to the Portland ComputerLand to see it and he was hooked. He waited until a second ComputerLand opened and then went back to see if he could get a good grand opening price. They gave him a reasonable discount, but more importantly, he received a written commitment for same day service, provided he called ahead and got there before 10 a.m. Since Portland was a fairly regular trip, he expected this arrangement to be satisfactory. He was right. In a full year of daily use he has never had to take the machine in for service. In addition, a ComputerLand has opened in nearby Kennewick, Washington, making access to service even easier.

Vineyard Inventory

The vineyard inventory that Mohr developed is probably his most powerful application. The program keeps track of 8 yards, 900 rows, and can even bring up information on any one of 55,000 individual vines. John records the age and condition of the vines, the date of most recent pruning, and when the next spraying should take place.

Historical information is also maintained for sugar quantity, and date of last year's harvest. This is critical information, because only 4 hours separate harvest from sale, and the processors pay on the basis of sugar content. This permits precise planning for his own picking as well as the custom picking he does for his neighbors.

Other Applications

Cash management is obviously critical in these times of high interest, so Mohr uses the computer to keep track of his investments. His goal is to eliminate borrowing wherever possible and, with the computer, he is close to attaining it.

Another important application is machinery and equipment depreciation and cost analysis. His tipoff for considering replacement is when the annual expense on a piece of equipment exceeds 10 to 15 percent of its value. He said, "Experience tells me that at this point maintenance may begin to nickel and dime me to death. Every repair that I make after that is a flag that something else will probably go wrong." He even makes use of the computer to help evaluate the new replacement options.

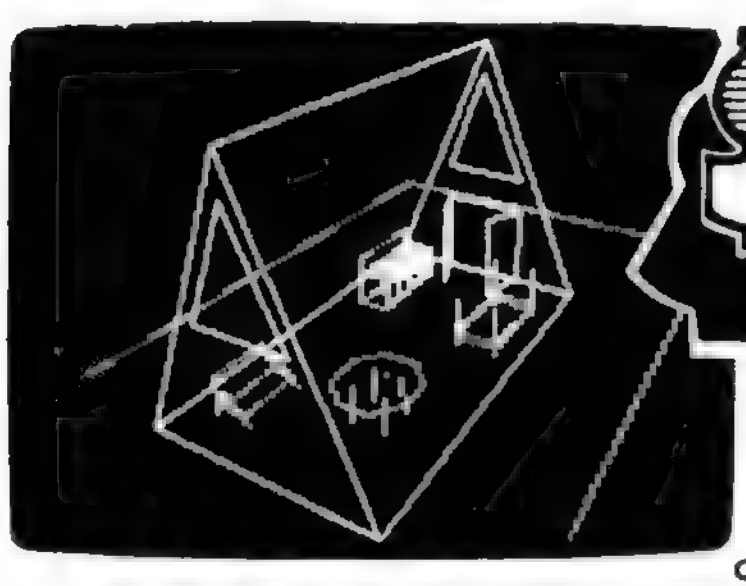
When he is not using the computer for the farm Mohr does the accounting and budget preparation for his church and the private school his youngsters attend. The computer is so prominent in the family that it is seldom turned off. Mohr's son uses it for math and educational games. (Dad won't tolerate space shoot-'em-ups.)

PC Pioneer

John was an IBM PC pioneer, but he says, "I never was too concerned, I knew my friend from IBM would back me up and I also felt that ComputerLand would ultimately move into the Tri-Cities. My only regret is that when I purchased my PC they didn't have the double-sided, double-density 320K disk drives." He said, "Switching disks with large programs is really time consuming. I did conquer the slow printer speed by adding a 16K spooler which has a microbuffer, so the printer is not taking up valuable computer time."

Because of Mohr's background, the Peachtree's double-entry General Ledger came naturally to him. He makes those six-digit chart of accounts codes really produce. His expenses are broken down by tax categories and he can pull out a percent of total by each category whenever he needs it. The software provides for 99 departments or enterprises, but since his is a one-crop operation, he doesn't departmentalize. One feature that he really likes

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- Two Disk Drives (160 or 320 KB)
- 128 KB RAM
- Color/Graphics Adaptor

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is the ability to custom format his income statements by chart of account categories. This gives him the ability to use the income statement as a management tool one day, and as a progress report for the bank the next. Each piece of equipment is coded with the same last three digits, which helps in keeping track of machinery costs and repair expenses. This extremely important cost center is such a critical variable that many farmers set up this category as a separate enterprise. John's method is easier, but seemingly as effective. He does a substantial amount of custom harvesting, so he keeps that income separate from the grape sales.

Mohr was very satisfied with the documentation on the *General Ledger* and *Accounts Payable*, but he did have one complaint. "I wanted to keep a current budget and last year's data in the system so that I could compare both ways, but the software just isn't built for it."

THE BOTTOM line in any business is profit, not just survival.

The Peachtree *Accounts Payable* program is really an asset, even though he averages only 15 to 20 checks per month, excluding payroll. The program is designed to write checks to all of his trade accounts and then post them to the general ledger. He said, "The vendor reports I can generate have really helped me negotiate discounts. Also posting and check writing mistakes are eliminated. That kind of peace of mind is worth a lot."

Payroll Program

Mohr is writing his own payroll program and he intends to keep it simple. "I write my payroll checks by hand, because I have so few workers and those are mostly seasonal. Because harvesting is mechanized, pruning is my major labor expense. What I really want the payroll to do is keep track of individual employee records and check numbers, calculate the FICA amounts and prepare my 30 or so W2's at the end of the year. I can handle figuring the piece work and hourly rates and I don't deduct State Industrial, so it isn't hard."

"The biggest pain," he said, "are the government requested individual employee reports, which are never the same and come at the worst times. If my payroll records help here, I can save critical hours of search time. What might take 4 or 5 hours by hand can be cut to 15 or 20 minutes."

Mohr, like all really successful farmers, is a businessman first. As he says, "The bottom line in any business is profit, not just survival." And of all the tools he uses, the IBM at the Double M is one of the best at paying its way. */PC*

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BCI

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SIGHT AND SOUND/A. SCOTT EARLE

With PC-Title and your PC, you can create graphics titles that can be photographed or printed out for use in home and business.

Creating Graphics Titles

The IBM color monitor for the PC seems to beg for programs designed to show off its brilliant colors and the computer's graphic capabilities. It's a pleasure, then, when a software program that shows off both monitor and computer to their best advantage turns up.

PC-Title, with its companion program, *PC-Projector*, is such a program. It is designed around an existing character font, which creates graphics "titles." The programmer, Tom Hall of Santa Clara, California, has included the character font in a compiled BASIC program, which is not only useful, but fun to play with.

PC-Title's graphic character titles can be created, stored, or listed in any desired order and then "projected" on the color monitor screen. They may be photographed to make title slides for home slide shows, business or educational purposes, or any other use.

When you load the diskette into your disk drive, you find that there are actually three separate sections to the program. The first, *PC-Title*, is for creating medium-resolution graphics; the second is for high-resolution graphics; the third, *PC-Projector*, is designed to display sequences of titles on the monitor.

Make your choice by entering the name in response to the DOS prompt, and you are presented with a long list of letters—B,C,D,E,L,N,P,Q,R,S,W—which serves as an abbreviated menu. It doesn't take long to learn that typing B allows you to choose a background color, C clears the screen, E erases lines, L chooses large letters for the titles, N (for normal) chooses small letters, and so on, through Q for quit. Choosing large or normal letter size leads you imme-



This title announcing a computer-age garage sale was created on-screen using PC-Title and was printed in black and white.

PC-Title 1.5
PC-Projector 1.0
PC Solutions
628 Hobart Terrace
Santa Clara, CA 95051
(408) 243-4169
The Source TCM644
CompuServe 72155,1114
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Requires: 128K RAM, one disk drive, RGB color monitor, and color graphics board.

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diately into the composition of a title.

Next you are given on-screen instructions on how to enter the text. Text may be centered, flushed right, or flushed left; you may also make substitutions. Finally, a choice of colors is given both for the letters and for a surrounding box, if you choose to have one. Once created, titles may be saved or recalled from disk storage. To do so, return to the menu and select S or R, respectively. The high-resolution mode runs the same way as the medium-resolution mode does. To enter, type "hi-title" in response to the DOS prompt.

When you select *PC-Projector*, the computer assumes that titles have been composed and saved on disk. It will present you with instructions to (1) LOAD SEQUENCE, which permits you to choose the sequence in which you want the slides to appear and then load them into the computer; (2) LIST/SAVE SEQUENCE, which saves the program sequence on disk and gives you a choice of displaying the titles on the monitor or printing them out. The final choice, (3) RUN SEQUENCE, determines which of the following options will be used for titles that are to be projected to the computer screen. Titles may be numbered unobtrusively according to order of appearance, and they may be programmed to appear and to remain on screen for any desired length of time. If you so choose, the sequence will then repeat itself without further prompting, or the titles may be changed on command (a plus sign (+) to move forward in the file sequence; a minus sign (−) to move back-



Graphics titles can be created on-screen using PC-Title. *The monitor was photographed to create these slides, which illustrate the letter size, format, and some of the colors that are available with this program.*

righted material

ward). Exposures can be made automatically using a camera equipped with a motor winder and controlled by the computer through a cable from the cassette port. The method of doing this, as well as other photographic hints, are included in the documentation.

Photographing the Screen

Despite warnings about the pitfalls of attempting to photograph the computer's display screen, it really is not difficult to do. Reasonably good slides can be generated without using expensive equipment. (Note: Before photographing, you must clear the prompt from the screen. To do so, select W (for wait) from the menu.) Colors are true; screen displays show little evidence of distortion that occurs as a result of the screen's curvature. Light falloff is present at the corners of the screen, but it is not obtrusive. If you are willing to invest a little time experimenting and taking careful notes, you'll be able to produce satisfactory title slides using *PC-Title*.

The monitor, however, is the primary display vehicle. One after another of the colorful titles (or computer slides, if you will) flash onto the screen. The IBM monitor's colors—and I imagine those of other good RGB monitors—are so striking that the progression of titles being displayed is truly attention-getting. I suspect that some pretty boring material could be presented quite effectively using the computer and the color monitor for display, particularly if other graphics, such as charts, were worked in. Disk space does limit how many titles may be stored. Each title uses 16,512 bytes; thus only 20 titles may be stored on a double-density double-sided disk.

Printing

When you enter the program, you are given the choice of two printers: the C.Itoh 8510 Prowriter or the NEC 8023. You are told that you must choose one of these two, or you cannot continue the program. But I found that the Epson/IBM printer also could be used if supported by the *graphics com* program from DOS 2.0. (The *graphics com* program may be obtained gratis from any IBM dealer and copied to the *PC-Title* disk to be loaded with autoexec.) Once this is done, the screen may be dumped to an Epson/IBM printer at any point using the usual Shift/PrtSc keying.

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The titles are printed out in shades of gray appropriate to the hue and brightness of the original on the monitor. These printouts represent the best graphics that have come out of my Epson up to this point. This printout capability permits composition of signs and notices, whether for computer-age garage sales (see example page 619) or anything else; your imagination is the limit. Interestingly, any title that does not fit vertically across the width of the paper will be printed sideways along the length of the page. Transparent acetate sheets can also be printed for overhead projection—another effective means of visual presentation.

Surely *PC-Title* can't be perfect; doesn't it have something wrong with it? It does, but its shortcomings aren't serious. They are mildly annoying and chiefly related to the limitations of IBM's Advanced BASIC for color graphics.

You'll discover, for example, that there are certain color combinations that just can't be used. Backgrounds may be chosen from 15 colors, but foregrounds and the color box that may be placed around the characters are limited to the two "palettes" that IBM BASIC provides: green, red, and brown plus background on one; cyan, magenta, and white plus background on the other. Because of these restrictions, it is impossible—no matter how patriotic you may feel—to create a title in red, white, and blue.

There are other color restrictions. A high-resolution program making use of compressed characters is also on the disk (but is usable only in medium resolution with the IBM color graphics board). For this, only one of seven foreground colors plus black or white may be used. But because of the compressed characters, this program is especially useful if you must cram in a lot of information on one slide.

Despite *PC-Title*'s limitations on the choice of colors, there are many striking combinations that may be used. For instance, two-tone color foregrounds on a black background are extremely effective; with these, the brightly colored foreground letters really shine through the IBM color display's black screen. Further, for photography, use of the black background avoids the light fall-off at the corners of the screen that is seen with other colors.

Documentation is a bit skimpy, but it doesn't make too much difference, because the program isn't all that complicated to use. Hall is presently in the process of upgrading the directions. He'll also answer questions via phone or electronic mail.

I enjoyed working with this program, and I think it is a good one. Others may come along with a wider selection of colors or a choice of fonts, but it will be hard to beat *PC-Title* at its price. The program has many potential uses, particularly for PC users with an interest in education, color photography, or in creating visual displays for any purpose. And, it gives the user some appreciation of the color graphics capability of the IBM PC. Finally, it's a program that is just plain fun to fool around with. */PC*

THE brightly colored foreground letters really shine through the IBM color display's black screen.

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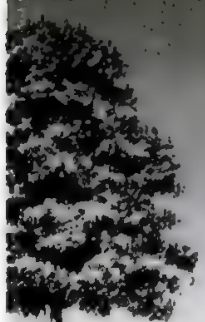
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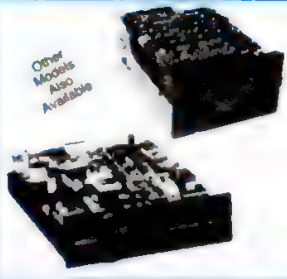
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This month's arcade presents three unusual efforts: the zig-zagging Styx, the silly dancing J-Bird, and the shoot-'em-up game, Snipes.

Birds Of A Different Feather

What a treat, Knights of the Round Joystick Button! Here are two clever, fun, colorful, and *different* games that do not call upon us to kill our friendly neighborhood visitors from outer space. There may be hope for us yet, when someday we apply for membership to the United Federation of Planets. And (sigh) though the third game reviewed here is yet another shoot-'em-up, I must admit it does offer a few interesting twists on the otherwise terribly familiar scenario: "Shoot first, ask for congressional approval later."

Styx

Windmill Software, Inc.
2209 Leominster Dr.
Burlington, Ontario, Canada L7P3W8
(416) 336-3353

List Price: $39.95

Requires: 64K RAM, color/graphics adapter, color or monochrome display (color RGB recommended), joystick optional.

CIRCLE 660 ON READER SERVICE CARD

They tell me this game arrived in the *PC* offices in the hands of a uniformed representative of the United States Government, claiming to be an employee of the Postal Service. I don't believe that for 1 nanosecond. This package was obviously devised by a Neptunian vacationing on the beaches of Triton and is merely marketed by a bunch of well-meaning Canadian dupes.

Styx is different from practically anything that has crossed our threshold here, and, though its long-term appeal is probably limited, it may be worthy of a place in your collection.

Your task in this game is to draw a line—from the keyboard or with a joystick and button—from one point on a frame to another. What makes this seemingly simple task a significant challenge is the presence of the "Styx," a whirling, zigging and zagging object that moves around the screen in a random pattern. It changes directions, it changes shapes, it changes colors, it changes sounds; and, given the chance, Styx will charge right at your moving line and zap it.

That's it, folks: No storyline, no shooting, no predetermined maze patterns—just hand-eye coordination, quick reflexes, and a bit of luck.

The mere mention of colors and sounds doesn't do *Styx* justice. The sound of the moving Styx is somewhere between the distant hum of a swarm of killer bees and the throbbing pulse of an overheated electrical transformer on a broiler in Texarkana in August. I counted—with difficulty, since I could barely spare the concentration in mid-game—eight colors pulsing around the screen: pale blue, orange, red, green, purple, dark blue, white, and black.

The object of the game is to carve up portions of the screen and claim that territory as your own. You win the round when you've captured at least 80 percent of the screen; you lose when you've been zapped three times by the Styx. You can lose a turn if you are touched by a little, easily overlooked "guardian" dot which moves around the edge of the frame. In

some of the upper levels there are two or more guardians to distract you.

Property is appropriated by drawing lines to connect points on the border. Using the joystick, you control the direction of your drawing marker with the stick and initiate the line using the button. Using the keyboard, you use any or all of eight keys on the numeric keypad (the arrows for 90-degree moves; 1, 3, 7, and 9 for diagonals) in combination with the F1 key to begin drawing. I found the keyboard version quick and responsive, but more difficult than the joystick. I recommend that you foresake the keypad, if you can. The game can also be viewed on a monochrome monitor hooked up to the color/graphics adapter, but you do suffer a terrible loss by not experiencing the kaleidoscopic colors of this game.

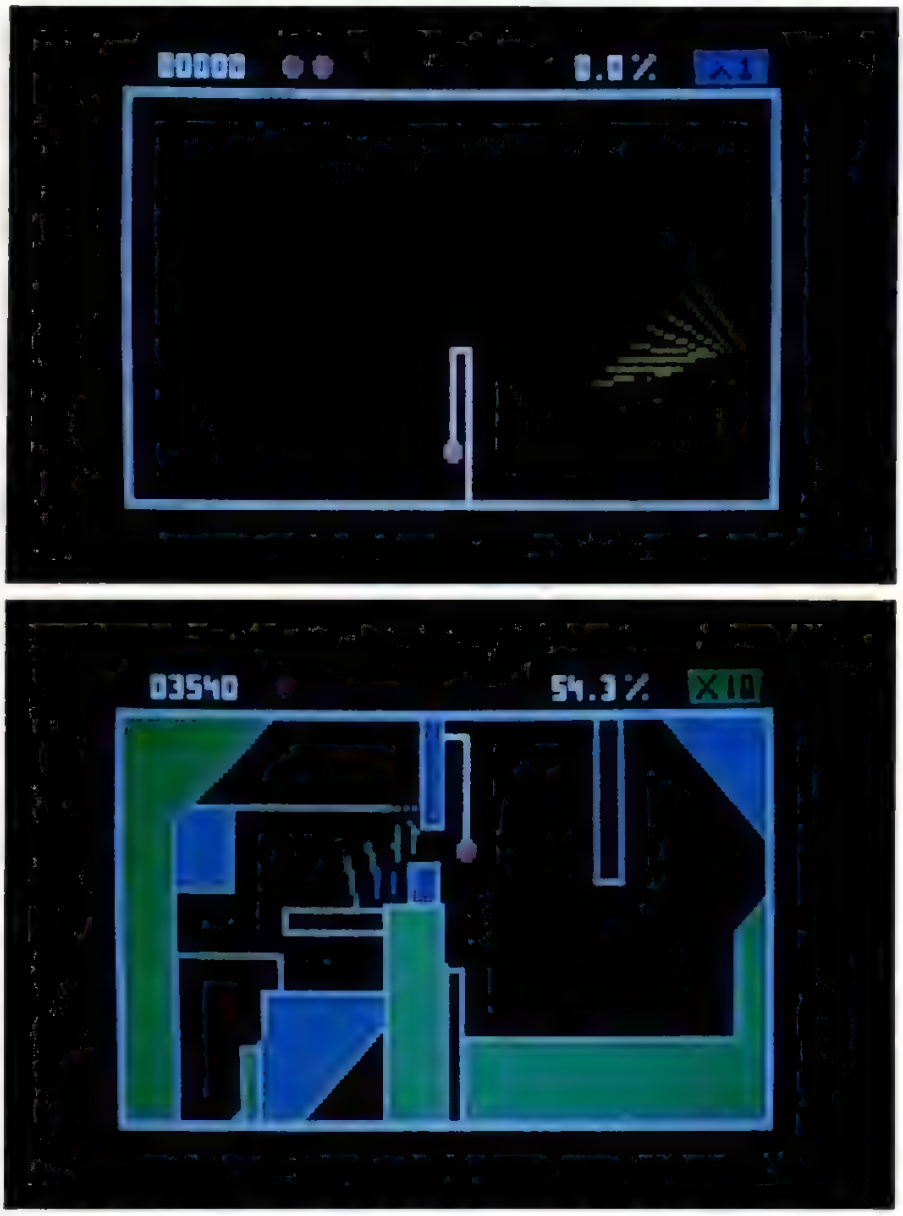
Points are awarded based on the percentage of the screen you capture with each move. A bonus block in the upper-right hand corner will display a blue 1, a red 5, or a green 10 at various times; your percentage of capture is multiplied times that factor shown each time you complete a move. The round ends when you grab at least 80 percent—if your final capture takes you beyond that figure, you get 1,000 bonus points for each extra percentage over the minimum.

The game automatically records the top ten scores and the initials of players. The sound can be disabled using the F9 function key, and the game can be paused in mid-zap by pressing the spacebar. The image can be centered on your screen using the Ctrl key combined with the left or right arrow. There are no choices for level of intensity; each game starts out at the same frenetic pace.

There's really not much else to say about this game, but I will let my neighbors in on the answer to the question that has been plaguing the lower Hudson Valley for the past week: The strange glow and weird colors emanating from the second-floor office of the house on the hill is Sandler, in the grips of the aliens *Styx*—and loving it.

On PC's scale of one to six, *Styx* rates a high mark:

FUN:	5
CHALLENGE:	4.5
GRAPHICS/SOUND:	5
TOTAL:	14.5



The game STYX begins with a blank field (top). Your job is to draw lines to join points on the frame and capture at least 80 percent of the screen. Here, in the bottom screen, the player is about to capture a large field.

J-Bird
Orion Software
P.O. Box 2488
Auburn, AL 36831
(800) 821-8088
List Price: $36.95
Requires: 64K RAM, color/graphics adapter, RGB or composite color monitor or monochrome monitor, joystick and game adapter optional.

CIRCLE 659 ON READER SERVICE CARD

J-Bird is one of those very silly, pointless games that I found myself unable to stop playing. Its graphics are clever, its sounds are cute, and its play action is quick and moderately challenging.

The J-Bird's goal in life is to hop down, up, and across a three-dimensional pyramid of colored cubes, changing all of the colors to a uniform hue. In the process, it must avoid bouncing apples, hopping snakes, clutching cats, and other assorted critters that apparently live in three-dimensional pyramids of colored cubes.

If you are caught by one of these critters, your bird lets out a little squawk and

a string of deleted expletives. If you manage to send your bird off the side of the pyramid in a kamikaze leap, it utters a heart-rending cry straight out of *Tit-Willow*. There is also a special escape from danger when you are being pursued by a cat or snake. Parked just off each side of the pyramid is a pair of wings. If you can manage to maneuver your J-Bird to a position just below them, you can jump into them and fly up and out of danger to the top of the heap. And, if you time the jump so that your attackers are a step behind you, they'll dive off into space and bother you no more.

J-BIRD IS one of those very silly, pointless games that I found myself unable to stop playing.

In the first few rounds your task is to convert all of the cubes to one color by jumping on them. In the upper reaches, you'll have to land on each square twice to change the color to the proper hue. And, there are special demons that torment you by suddenly appearing and changing the colors back to their original unacceptable color.

The pussycats deserve special mention, too. They were cleverly designed, showing one profile as they jump left and a second profile as they jump right. More impressive, though, is the creation of a believable mewing sound emanating from the PC's speaker.

You can choose one or two player versions of the game (players alternate turns), and there are four levels: novice, intermediate, advanced, and brutal. The game can be played from the keyboard using any of 12 preset key combinations for the up/right, up/left, down/right, or down/left moves. I found the keyboard version quite acceptable. However, using the joystick was easier, and I tended to rack up higher scores playing this way. The program includes a calibration setting for joysticks. I found it necessary to run the program each time I booted the game in order to get predictable responses. You are given a choice of RGB or composite color modes, or a monochrome mode at the start of the game. (More about the mysterious monochrome later.)

J-Bird comes packaged in a sturdy and attractive plastic case and includes a well-written, well-presented instruction manual. The sound can be toggled on or off, and the game can be paused in mid-hop or restarted at a different level. There is a registry of top scores, with initials.

A few nits: I mentioned the choice of a monochrome mode (for a graphics-capable monitor plugged into the color/graphics adapter on the PC). That's a very nice

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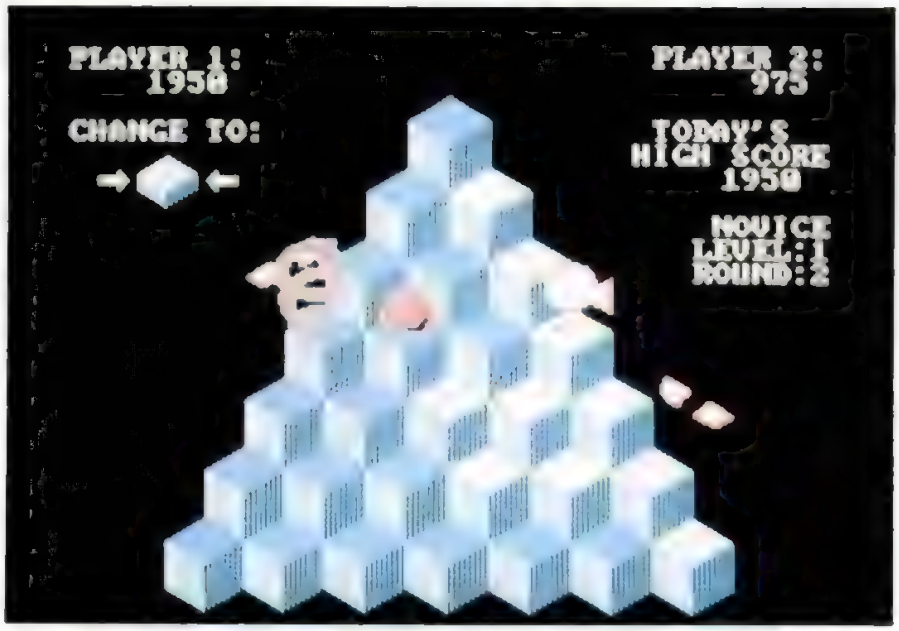
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CIRCLE 217 ON READER SERVICE CARD



In J-Bird the bird hops around the three-dimensional pyramid changing all the colors to a uniform hue.

option to offer to game players who may not have a color screen. In the monochrome mode, "colors" are designated by stripes. However, in *J-Bird* I was perplexed to find that in the opening round, and in a few of the upper rounds, it was impossible to tell which cubes the J-Bird had landed on. The stripes remained unchanged. Another objection I have is the game's insistence that the J-Bird do a little demonstration dance at the start of each new round. This becomes tiresome very quickly, and there was no way to give the bird the night off.

Nevertheless, like *Styx*, this game is a *J-Bird* of a different feather. It's different from most of the other offerings on the market.

On *PC*'s rating from one to six, a quite respectable score for *J-Bird*:

FUN:	4
CHALLENGE:	4
GRAPHICS/SOUND:	4
TOTAL:	12

Snipes
Superset Software Corporation
P.O. Box 1036
Orem, Utah 84057
List Price: $39.95
Requires: 64K RAM, color/graphics or monochrome display adapter, color or monochrome monitor.

CIRCLE 658 ON READER SERVICE CARD

Remember those terrifying scenes in the movie *Alien* during which our various heros and heroines were forced to crawl through the ventilation pipes of the space freighter, blow torches in hand, in a search for the murderous monster lurking around the corner?

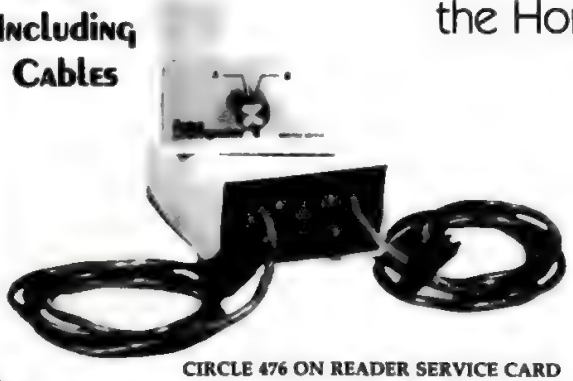
In *Snipes* you are the searcher; you prowl the face of a maze as you seek to kill off tens or dozens or even hundreds of the little "Snipes" that move into your area of view, wait around the corner, or lurk overhead. Yes, it's another shoot-'em-up in space, and regular readers of this column will recognize this reviewer's general predilection to cosmic yawns for such efforts, but I must admit that *Snipes* fits in with this month's trio of nonstandard efforts.

First nice touch: The maze on your screen is randomly generated by the computer at the start of each round and thus presents different challenges each time and eliminates the mindless *PacMan*

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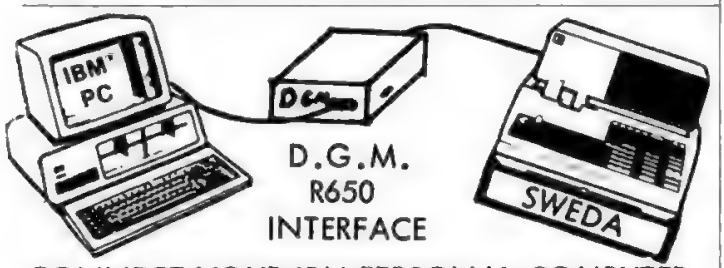
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strategies of memorized maze patterns.

Second nice touch: There are 234 different levels of play! The game includes nine different variables, and the player can choose a skill level from A to Z and then select from 1 to 9 for numbers of shooters, shootees, and "portals."

Third nice touch: The game, which uses ASCII characters for its perfectly acceptable graphics, can be played on a color or monochrome screen, and with the color/graphics adapter or with the monochrome adapter. All input is from the keyboard, so no joystick or game adapter is needed. Hear that, office game players?

You are the star of this show, a hunter positioned in the center of the screen. The maze spreads out all around you. On an RGB color monitor, the walls are IBM blue against a black background. What you are looking at is actually just a small portion of the maze, perhaps a quarter of the entire field (kind of like a window on a spreadsheet). The maze is actually a sphere, wrapping back on itself. When you start, there may be no Snipes anywhere near you. Stand still and they'll find you; go after one and his friends will congregate in his defense. The Snipes will shoot arrows, they'll sidle up to you and explode, and, in some of the upper reaches, their arrows (or your bullets) will bounce off the walls and ricochet right back at you.

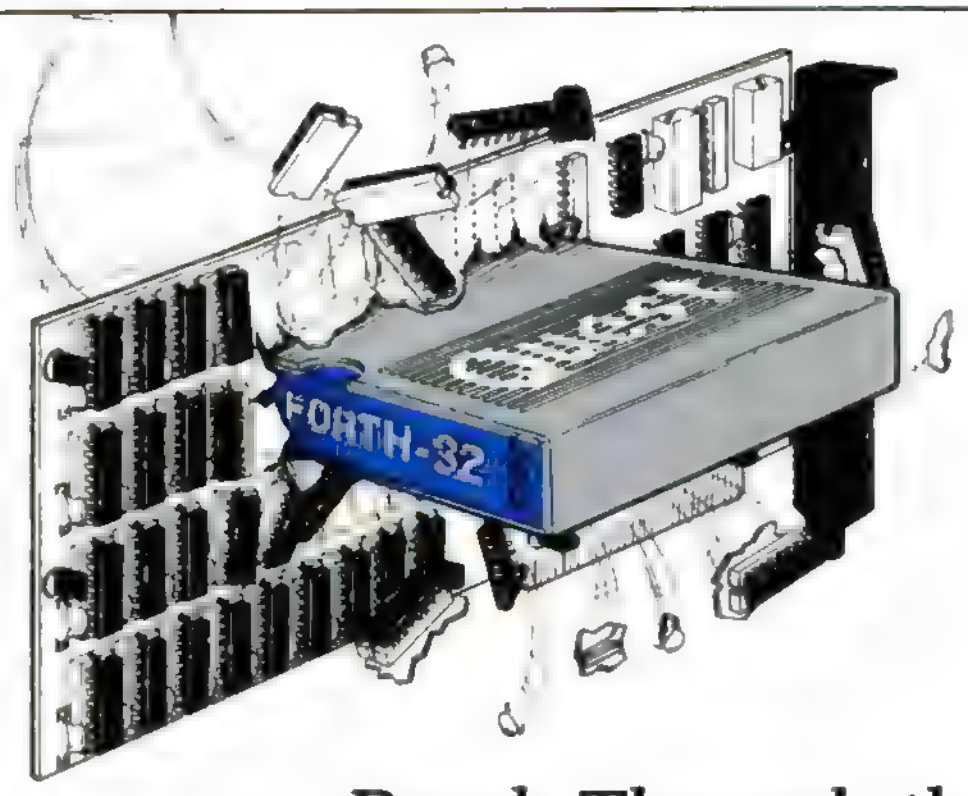
A few other hazards: In some levels the walls are electrified and will kill you if you touch them. There are smaller Snipes that can hide more easily behind corners; there are more aggressive Snipes that will fire more often and with better aim.

In the network version, the two players are shooting at Snipes or at each other.

The key to winning at *Snipes* is to find and destroy all of the portals that allow Snipes to enter into the maze. Depending on the skill-level number you choose, there are from three to ten such doorways. Until you've blasted away the portals, it's a losing battle; the bad guys keep replenishing themselves.

At the top of the screen is a scoreboard that tells you how many portals you began with and how many remain, how many Snipes you've killed and how many are presently in the maze, the skill level you've selected, the elapsed time, the number of lives you have remaining, and the game score. The game does not keep a list of high scores. You can toggle on or off the sound of the Snipes' firing; you can also turn on or off a sound effect for each bullet you fire. The game can be paused in mid-massacre and resumed.

The instruction manual is well-written and complete, although a bit random in its



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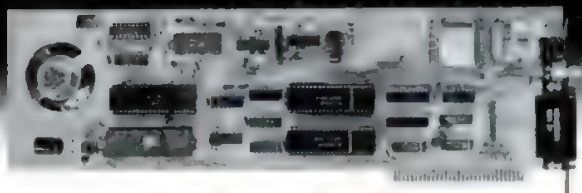
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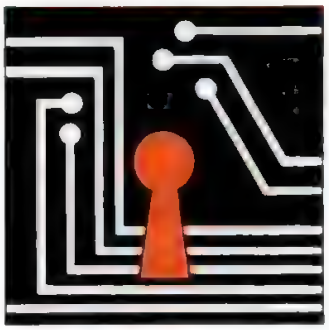
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presentation of the rules and regulations. The game itself seems to be bulletproof; I could not crash it.

One other intriguing item about *Snipes:* In the course of PC's test of networks for our November issue, a technician from Novell called a few of us back into the "Toy Shop" (our laboratory) to show us a demonstration of his company's ShareNet system. There, on two IBM PCs across the room from each other, was *Snipes.* Only, in this network version, the two players (or dozens, if the network had been configured that way) merrily cruised along the mazeways shooting at Snipes or *at each other* whenever either player happened to stray into the maze area of another player on the network. Beam me up, Scotty. This is getting scary.

On PC's rating scale from one to six, *Snipes* picks off a decent score:

FUN	3
CHALLENGE:	3
GRAPHICS/SOUND:	5
TOTAL:	11

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The game Snipes randomly generates the maze on your monitor for each round of play.

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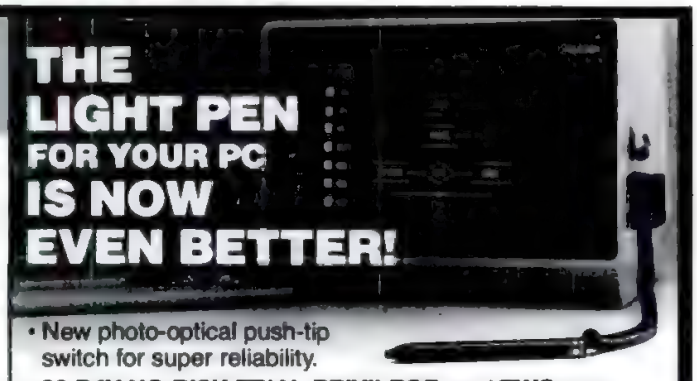
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MARK ZACHMANN

Printing Spanish symbols, returning to BASIC, keeping a log of computer use, and calculating the day of the week are topics covered in this session with the PC Tutor.

PC Tutor

¿Where's The Question?

Q: We have a PC with a NEC Spinwriter 3500-Q letter quality printer with a multilingual print thimble. We are starting to do a lot of correspondence in Spanish, but *WordStar* doesn't seem to have the ability to print the upside down question mark, the upside down exclamation point, or the Spanish accent mark.

These characters do exist on the PC and on our printer, so it seems that we have a software problem. Is there a patch we can make to *WordStar* for this purpose, or do you know of a word processing program that will include these characters on our printer?

David Schecter



A: *There are three approaches you can take to this problem. None will allow you to see the characters displayed on the screen, despite the fact that the IBM PC contains them in its character set.*

The first approach is to reprogram the Spinwriter translation table (called a "RAM Thimble Map") so that whenever the printer encounters certain characters, it will print one of the Spanish characters. If there are three characters you don't need, such as the braces and the ampersand, then you might try this. Programming the Spinwriter RAM thimble map to use alternate characters is not, however, a simple task. You will need to know where every character is on the print wheel, and what intensity to use for the printing. The process seems to be one of trial and error.

Take a look at page 70 in PC, Volume 2 Number 1 for a short BASIC program that will generate a thimble map, along with some discussion of how to use that.

A simpler approach uses the fact that some characters with values over 128 can generate the additional thimble characters automatically. For example, I use the Spinwriter's Super Courier wheel; with this wheel, character number 199 generates a ⅝ symbol. If you know which character values generate the Spanish characters, then you can convince WordStar to print properly in Spanish. The following BASIC program can be used to discover correspondences between the Spinwriter's characters and their numbers.

```
10 REM Pick a starting point
20 INPUT "Start at what ";A
30 REM Now print 10 characters
40 FOR I=A TO A+10
50 LPRINT CHR$(I);
60 NEXT I
70 LPRINT
```

I suggest starting with A = 180 and repeating the program to see each group of ten characters. To convince WordStar to print any of the characters you find, just program WordStar's user functions appropriately. Four user functions are available: Ctrl-Q, Ctrl-W, Ctrl-E, and Ctrl-R. If you wanted Ctrl-R to print the ⅝ symbol, you could do the following.

Put the PC-DOS disk in drive A: and the WordStar disk in drive B:. Then respond to the PC-DOS and DEBUG prompts by entering the underlined characters.

```
A>DEBUG B:WS.COM
-E78E  I  C7
-W
-Q
A>
```

This will cause WordStar to send character 199 (hexadecimal OC7) every time the program encounters a Ctrl-R. You enter a Ctrl-R into the text by typing Ctrl-P followed by R. With my Super Courier wheel, wherever I enter a Ctrl-R into the

text, a ⅝ will be printed.

Essentially, I told WordStar to print a string one character long, consisting of character number 199. By putting the string at 78E WordStar sends the string each time it encounters a Ctrl-R. For more information on my use of DEBUG in the above example, see the "PC Tutor" column in PC Volume 2 Number 4 ("Custom Control of Wordstar" on page 583).

There are some problems with this approach. First, you have sacrificed a potentially valuable user subroutine—the Ctrl-R routine. Also, you are limited to only four user subroutines of WordStar. Finally, WordStar will not align the text correctly, since it assumes Ctrl-R has zero width.

The last, and much simpler approach is to use a word processing program that can print those characters and space correctly. I would suggest you investigate The Final Word by Mark of the Unicorn. It has much better control over additional characters. The Final Word also contains fairly good documentation and a reasonable installation program for setting the spacing appropriately. This should make it worth your while to spend some time learning a new text editor.

Rapid Rewriting

Q: I have used the *Volkswriter 1.2* for several months and I'm quite pleased with its performance. I have noticed that on the IBM monochrome display it rewrites the screen almost instantly, while with the graphics adaptor it takes almost a second to write a screen. Can you explain why?

Bob Palmer
Englewood, Colorado

A: *The problem is internal to the IBM cards and there is nothing you can do about this, unless you prefer a snowy picture. For more information, see the answer to the next question.*

Snow POKE

Q: I have been trying to produce faster screen printing in BASIC. One alternative, suggested by IBM, is to use compiled POKE loops. This works well with the monochrome monitor, but it produces "snow" with the color/graphics adapter. I have found that any POKEing to the color adapter produces snow. Is there a way to correct this problem?

Peter Krouwer
St. Louis, Missouri

A: *The problem you are experiencing is a common phenomenon. Other people have probably noticed this condition in different contexts.*

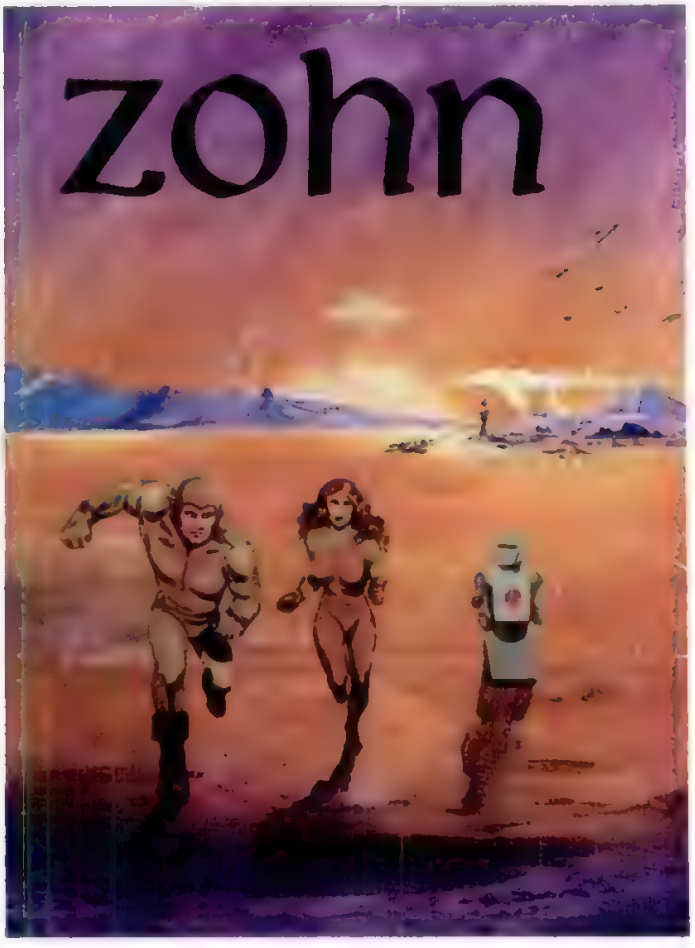
When you print text through the color/graphics adapter, you may have noticed that the screen flickers violently when it scrolls. For example, a simple disk directory listing, produced by DIR, can be nearly unreadable if the screen begins to scroll. The "snow" problem and the flicker are intimately related.

There was an engineering tradeoff in the design of the color/graphics adapter. In order to cut costs, IBM made the interface of the color adapter simpler than the monochrome interface. To understand the problem, examine the video interface.

In the year 2525 man's influence has stretched to the farthest reaches of the galaxy. Colonies have been established on uninhabited planets to advance civilization to all parts of the galaxy. All has gone well until one day several small colonies are attacked and destroyed by unknown assailants. Join Zohn in his search to find the assailants and stop their destruction of the colonies.

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CIRCLE 108 ON READER SERVICE CARD

A video adapter uses read/write memory just as the program and data memory do in your computer. Instead of storing programs, the video memory stores a pair of values indicating the character to be displayed and the attributes to be used. For example, the color adapter has 16K of memory beginning at B8000 (hex). If you store a "7" at B8000 and a "49" at B8001, you will see a "1" in the upper left corner of the screen. The "1" character has a character value of 49; it will appear when you enter this BASIC command:

```
PRINT CHR$(49)
```

The "7" in B8000 is called the "video attribute"; this value means to use normal video rather than a high intensity or blinking display.

The adapter works by scanning through 16K of memory 480 times a second. (Actually it uses only 4K of this memory for character displays.) Every time it reads the values of the character/attribute pair it puts a part of the "1" up on the screen. See Figure 1, which shows a "1" as it is displayed on the screen. The adapter reads the 7,49 pair eight times, each time displaying another "scan" line. If you write to the video memory while the adapter is reading the pair, then the values read by the adapter will be garbage. The result is snow on the screen, instead of the dots corresponding to a 1. This doesn't happen with the monochrome adapter because it has a faster, more sophisticated interface than the color/graphics adapter.

Figure 1: How the character "1" is generated on the screen by the color/graphics adapter.

```
SCAN LINES
...**... First
...**... Second
....*... Third
....*... Fourth
....*... Fifth
....*... Sixth
.******. Seventh
........ Eighth
```

With that problem in mind, you can see that there are only two ways to avoid snow with the color adapter. One way is to wait and not write to memory until nothing is being read from memory. These times—the retrace intervals—correspond to the time periods when no picture is shown while the TV's beam moves back to the left hand side of the screen or the top of the screen. The other way is to use a routine that turns off the display for an instant, writes to the video memory, and then turns the display back on.

The second approach is not really viable, because it causes the display to flicker. That is what you see happening when the display scrolls within the IBM software. Because scrolling takes so long, the IBM software avoids producing a really messed up screen by blanking (turning off) the video while scrolling occurs. The result is no snow, but there's very noticeable flicker instead.

The first approach—waiting for a retrace interval—is effective. This is used

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CIRCLE 482 ON READER SERVICE CARD

by the IBM software when it writes a single character to the screen. You can use the same approach. Since retraces occur so often (15,750 times a second with the color adapter), you won't slow your software down particularly. A short BASIC program to do this is shown in Figure 2.

Since the retrace interval is so short, you need to wait until its very beginning: the first time that bit 0 of the video status port (&h3DA) goes HIGH. Note that this tiny program will not work with the monochrome display, since the monochrome adapter uses a different status port.

I suggest you take a look at the IBM Technical Reference Manual. Page 3-60 describes the status port and page A-54 shows some assembly code that does the same thing as my BASIC program. Note that if you try this with interpreted BASIC, the BASIC is so slow that the screen really won't "snow" no matter what. I can only assume compiled BASIC is fast enough for this program to work. If not, you might need to call an assembly language subroutine.

Figure 2: A program to avoid snow on the screen by waiting for the retrace interval before writing characters.

```
10 REM If retracing, wait
20 WHILE (0 <> (1 AND INP(&h3DA))) : WEND
30 REM Now wait for start of retrace
40 WHILE (0 = (1 AND INP(&h3DA))) : WEND
50 POKE . . . (fill this in as desired)
```

An optimal approach is much like the one used by IBM. To write single (or a few) characters, wait for retrace intervals. For printing lots of characters, just turn off the video, POKE them all, then turn the video back on.

Beating the SYSTEM

Q: Can I get my program back if I exit from BASIC by entering "SYSTEM" by mistake?

On the CP/M-80 machine I used before, I could execute "GO 0100" and then be back in BASIC with my program and memory still intact. Is there a PC equivalent of this convenient command?

E. Amazon
Geneva, Switzerland

A: *Actually, the fact that your CP/M-80 machine allowed you to restart BASIC with everything intact is quite surprising. Indeed, CP/M-80 loads programs at a fixed address (unlike MS-DOS), so that performing "GO 0100" might rerun BASIC. I would normally expect, however, to find that BASIC had cleared the program by performing an implicit NEW command.*

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BASIC on the IBM PC, in fact, seems to modify its own code so that you can run it no more than once, even if you know where to begin. You might try the following experiment to see how that happens.

```
A>DEBUG BASICA.COM
-G=100
```

Entering the second line will execute the program. BASICA will run. Then you can type:

```
SYSTEM
```

and return to the DEBUG prompt, allowing you to enter this again:

```
-G=100
```

With some programs, the above procedure will let you run the program over and over. In fact, using DEBUG's "G=100" command is just like typing "GO 0100" within CP/M-80. If you try that experiment, however, you will find that your computer will lock up and nothing good can be done. Further investigation would reveal that a whole section of startup code is cleared out by BASICA, probably to save space. Since the interpreter's authors realized that some of the interpreter program is only called once (at the very start), they used the area twice. First for initializing the interpreter, then for part of the BASIC program itself.

Shifting the DIF

Q: I have read in your magazine and elsewhere that it is possible to interchange DIF files (Data Interchange Files created by *VisiCalc* and other programs) between an Apple III and an IBM Personal Computer. However, no one has mentioned the specific hardware and software that's required. Would you describe in detail how this interchange can be accomplished?

Teena Young
Hickory, North Carolina

A: *Yes, it is possible to interchange DIF files (and a number of other types of compatible files) between Apples and IBM PCs. There are two simple ways to do this.*

The way with the least effort would involve purchasing a Hayes QuadLink card, which lets your IBM PC imitate an Apple II. Since the Apple III has an Apple II emulation mode, you can pull any Apple II-compatible disk out of the Apple III and put it into an IBM PC equipped with QuadLink. Although this is the fastest and least effort approach, it is also the most expensive, since the QuadLink board has a list price of $680.

A cheaper, but more time consuming approach uses serial asynchronous RS-232 ports. Virtually any modem program on the market is capable of transferring ASCII files, including DIF files. An ASCII file is just a file composed of the usual 128 characters—letters, numerals, punctuation marks, and control codes.

By hooking up an IBM PC's asynchronous port to an asynchronous port on the Apple III, and using a modem program at each end, you can transfer DIF files using ASCII file transfer.

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Any hardware constraints can be avoided if you use modems on both ends and transfer the files over the telephone. This method, however, will restrict you to 1200 baud, or only 300 baud if you don't have two 1200 baud modems lying around. That is the easiest approach, but it's rather slow. A quicker approach is to tie together the two RS-232 lines of the Apple and IBM; then you can transfer files at the maximum speed of the two machines. For the IBM PC this is 9600 baud (about 1000 cps). I don't know the maximum for the Apple; I expect it depends upon which serial interface card you use.

If you do tie the RS-232 lines together, you will need to make sure of two things. First, both machines will think they are the computer-in-charge, so you will need to reverse lines 2 and 3 on one end of the cable (these are the receive and transmit data lines). Also, the handshaking will be backwards (assuming that the Apple's interface handshakes at all), so you will need to reverse the handshaking lines. Handshaking is a process of setting line values (voltages) to indicate readiness to send/receive a character and then resetting them while the computer pauses to digest the information.

For a discussion of the meaning of asynchronous lines you can check "PC Tutor" in PC, Volume 1 Number 9 ("Cabling a Printer") or refer to page 2-127 of the IBM Technical Reference Manual. My earlier answer is particularly appropriate because the printer under discussion (an Anderson Jacobsen 832) acts just like a computer.

Chip Times

Q: Recently I expanded my PC/XT memory to 256KB using 4164 250ns (nanosecond) memory chips rather than the usual 200ns memory chips. I did not experience any system degradation. Please explain if there should be any noticeable difference between the chips. Would 150ns chips have been better?

Patrick Ip
San Francisco, California

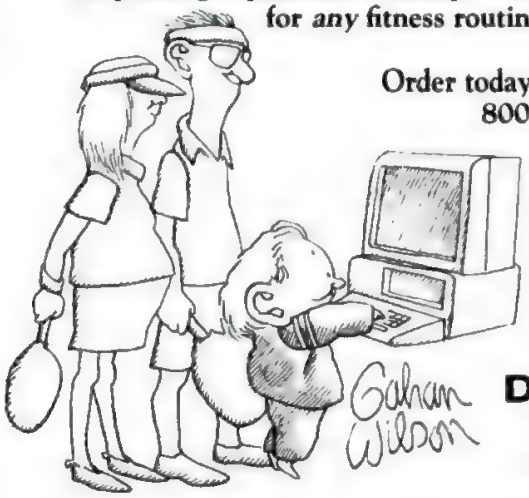
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Figure 3: A BASIC routine for calculating the day of the week given the month, year, and day.

```
10 IF (MONTH>2) THEN MONTH = MONTH-2 ELSE MONTH = MONTH+10 : YEAR = YEAR-1
20 IF YEAR = -1 THEN CENT = CENT-1 : YEAR = 99
30 DAYOFWEEK = (DAY + INT(2.6*MONTH-0.19) +YEAR + INT(.1+YEAR/4) +
INT(0.1+CENT/4) - 2*CENT) MOD 7
```


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can respond to a read or write request from the central processor (8088). Using chips with a different speed will not affect the performance of your computer, unless your chips are so slow that the data comes out too late for the processor. If that happens you will see PARITY CHECK errors. Note that the markings on the chips are a worst-case, maximum value; 250ns chips may respond quicker than that. In fact, very often the higher-quality 150ns chips are just hand selected from the same batch as the slower chips.

One of the nice things about the 8088 is that it will accept slower chips than could be used with a Z80 or 68000 of comparable speed. Both of these microprocessors would probably require 150ns chips for a 5mhz processor like the PC has. If you are not having trouble with your 250ns chips, then you have nothing to worry about (although the practice of using lower-rated parts is not recommended in general).

Installing 150ns chips, which are more expensive, would be a waste of your money. To speed up operation of your computer you would have to change the crystal oscillator on the main system board. This would have so many side effects that it is doubtful that any other speed would work. To begin with, the color/graphics adapter card gets its signals right off of the system board. If you changed the system speed the color adapter would no longer work with a standard color monitor or television.

If It's Tuesday, This Must Be BASIC

Q: How can I figure out the day of the week associated with a calendar date on my PC?

Michael Luschesi
Chicago, Illinois

A: *The simplest algorithm I know of is the BASIC routine given in Figure 3. MONTH, DAY YEAR, and CENT are variables that must be given by the program. CENT is the two leftmost digits of the year (for twentieth century dates, CENT = 19) and YEAR*

is the last two digits. Where DAYOFWEEK = 0, the day is Sunday; 1 = Monday, and so on. If you make sure that all of the variables are integers, you won't have any numerical precision problems.

(The formula used in this routine comes from Elementary Number Theory *by J.V. Uspensky and M.A. Heaslet, McGraw-Hill, 1939).*

Follow Those Users

Q: Our organization has recently purchased several IBM PC-XTs. We would like to buy more but the central management group won't allow us to do so without some "management statistics" to show how often the machines are used and by whom. Is there a software package available that will track this sort of information and generate appropriate reports?

Jeff Peterson
Anaheim, California

A: *Depending on what you desire in the way of a report, there may be a very cheap—in fact, free—solution you can use. Just set up the following batch program, called TRACK. Then have each user run that program at the start of every session with the PC. You would type, for example:*

```
TRACK Jeff Peterson
```

I suggest that you install all these files in the root directory of the XT's hard disk. First, create an automatic answer file, called CR, that contains a carriage return. Enter this line:

```
C>COPY CON: CR
```

After entering this line, press the return key again. Then, on the following line, enter Ctrl-Z. That will return you to the PC-DOS prompt. Now the file you created, called CR, can be used in the batch program called TRACK.

Create the TRACK program by entering the following lines:

```
C>COPY CON: TRACK.BAT
TIME >TMP1 <CR
DATE >TMP2 <CR
ECHO Logging: %1 %2 >TMP3
COPY LOG+TMP1+TMP2+TMP3     LOG
Ctrl-z
C>
```

Now, whenever a user types "TRACK Jeff Peterson," you will find three additional lines in the LOG file. The first will show the time of day, the second will show the date, and the third will say "Logging: Jeff Peterson" or whatever name the user enters.

To look at the file, just enter TYPE LOG *while in PC-DOS.*

A list printed out from the LOG file may be sufficient as a report. If not, you can write a simple BASIC program that will read the LOG file and come up with some summary statistics.

Overprinting Underlines

Q: I'm stumped. I'm attempting to output some data to a NEC 3550 Spinwriter. The information contains underlined data, that is, a line of information followed by another line containing only the underlining symbol. The other program must overprint the first line with the second line, hence the underlining.

My problem is that when I output this info with BASIC, the system automatically inserts a line feed at the end of the line. Do you have any ideas that may work?

Robert Long
Houghton, Michigan

A: *There are two approaches you can follow here. The simplest answer is to send just a carriage return character (ASCII 13). BASIC understands this and adds its own line feed. You can fool BASIC, however, by setting the parity (eighth bit) high, which the NEC will understand correctly. Thus:*

```
LPRINT CHR$(128+13);
```

will send a carriage return without a line feed.

If you know what you will be underlining ahead of time, a faster approach is to tell the NEC printer to underline. You can do this by first sending Esc - (hyphen). Then, when you're finished, send Esc ' (apostrophe). These BASIC commands:

```
LPRINT CHR$(27)+"-";

LPRINT CHR$(27)+"'";
```

will begin and end underlining.

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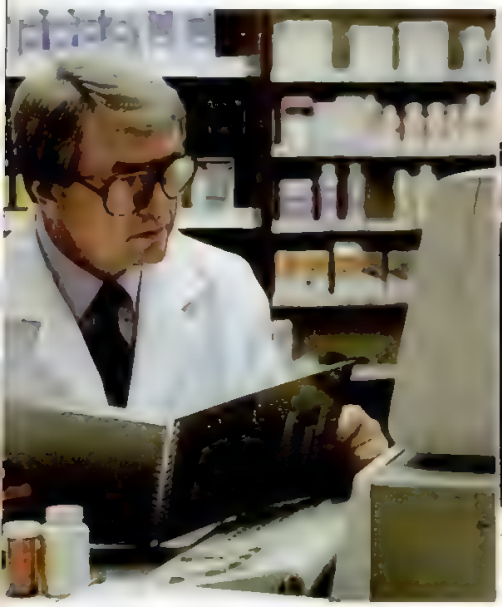
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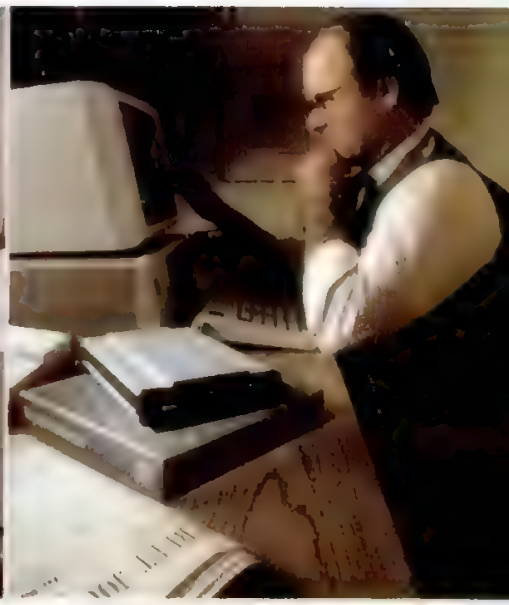
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Smartmodem 300, 1200 and 1200B are FCC approved in the U.S. and DOC approved in Canada. All require an IBM PC with minimum 96K bytes of memory; IBM DOS 1.10 or 1.00; one disk drive; and 80-column display.

Smartmodem 1200B. (Includes telephone cable. No serial card or separate power source is needed.)



Smartcom II communications software.

NOTE: Smartmodem 1200B may also be installed in the IBM Personal Computer XT or the Expansion Unit. In those units, another board installed in the slot to the immediate right of the Smartmodem 1200B may not clear the modem; also, the brackets may not fit properly. If this occurs, the slot to the right of the modem should be left empty.

And, in addition to the IBM PC, Smartcom II is also available for the DEC Rainbow™ 100, Xerox 820-II,™ and Kaypro II™ personal computers.

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CIRCLE 303 ON READER SERVICE CARD

CLUB NEWS/EDITED BY SUSAN HURLEY

Clubs, bulletin boards, and newsletters enable PC users to capitalize on their fellow users' knowledge.

PC User Groups

This list provides the names and addresses of PC User Groups worldwide. You can check this list to locate other PC aficionados in your area.

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124 Meadow Wood Loop
Daphne, AL 36526
(205) 626-9558

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The Anchorage IBM Personal Computer and Compatible Computer Users Group
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c/o General Computer Services
213 W. Sixth Ave., #11
Anchorage, AK 99501

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The Phoenix IBM PC Users Group
Fred Linch
P.O. Box 44218
Phoenix, AZ 80564
(602) 954-7519

IBM PC User Group
Theresa Baudier
P.O. Box 1489
Tucson, AZ 85701
(602) 622-4751

Phoenix IBM-PC Users Group
P.O. Box 44218
Phoenix, AZ 85064
(602) 954-7519

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Sacramento, CA 95825

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Ray Smyer
575 Ferndale Dr.
Santa Maria, CA 93455
(805) 937-7490

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Michele Albright
4005 Isle Dr.
Carlsbad, CA 92008
(714) 434-1608

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Linda de Sosa
P.O. Box 8292
Stanford, CA 94305
(415) 856-6281

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1384 Caliente Loop
Chula Vista, CA 92010
(714) 421-9686

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7255 Orchard Dr.
Gilroy, CA 95020

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Phil Root
6242 Moonfield Dr.
Huntington Beach, CA 92648
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Modesto-Turlock IBM PC User Group
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Modesto, CA 95352
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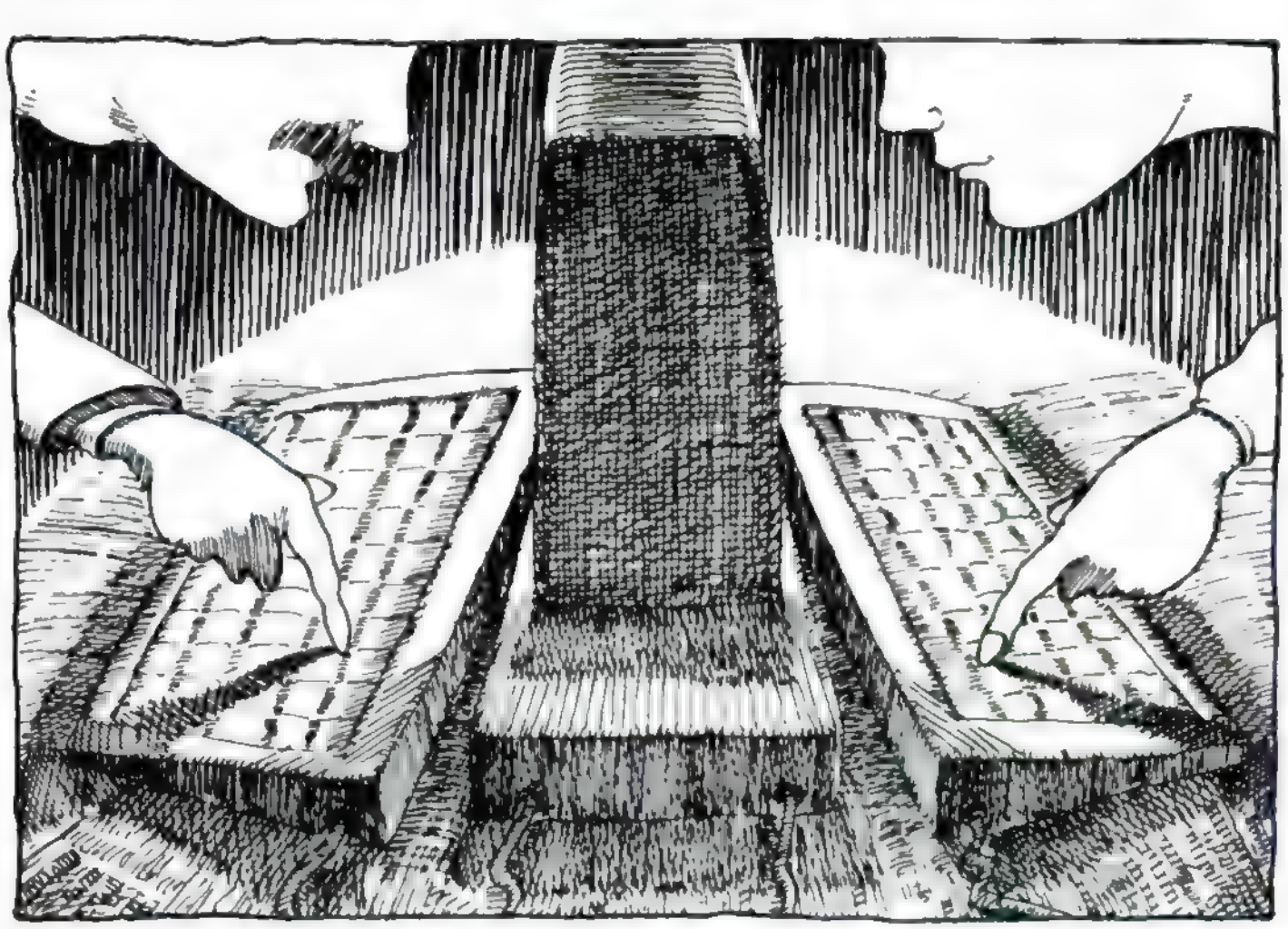
User-To-User

The discussion of ways to make the PC more functional for handicapped users continues this month. We also have some more printer tricks and a solution to DEBUG's inability to handle the PC's interrupt structure properly.

DEBUG Debugged

Many people who have used IBM's DEBUG program have discovered that it occasionally "locks up" when single-stepping (tracing) a program. The system becomes totally unresponsive, and the only way to recover is to turn off the PC and then turn it on again, destroying anything in memory. Typically, this happens every 15 to 20 minutes; the intervals are just long enough to lull you into an innocent sense of progress before the next crash. Fortunately, once the cause is understood, this bug is fairly easy to fix.

The source of the difficulty is that the keyboard communicates with the system through the 8259A interrupt controller chip. This controller is set up to prioritize the device interrupts; when a higher priority device is being serviced, all lower priority or equal devices must wait. DEBUG hangs up whenever it stops tracing in the middle of an interrupt equal or higher in priority than the keyboard. DEBUG waits for input from the keyboard before it will proceed, but the keyboard is locked out until the program proceeds—an inescapable dilemma!



The solution is to prevent DEBUG from tracing these high priority interrupts. In most cases they are not part of the user's program, so tracing them is not very valuable, anyway. The editing procedure in Figure 1 will eliminate the problem.

The first two edits (E) in step 2 make space for the new code by increasing the address at which DEBUG loads your program. The third edit causes each single-step to execute the check code before going to the usual part of DEBUG. See Figure 2 for the active code itself. (Note: with version 2.0 you could use the assemble command to insert the added code directly at 2F18.) This polls the interrupt controller to see if a high priority interrupt is in progress and skips the DEBUG trace if it is. Tracing will resume after control returns to your program following the interrupt.

Note that the new version will take up slightly more space on your diskette than the "bugged" DEBUG. Some of this space is wasted by what appears to be a buffer that DEBUG creates above itself in memory. The new version saves this buffer on the disk whereas the old version did not. I have yet to see DEBUG use anything but a small part of this space, but it's safer and easier to tack the change onto the end of DEBUG than to try to find and correct all references to the buffer without the source code.

Stephen Baumgartner
Reading, Massachusetts

The above technique works well and avoids the hassle of manually resetting the 8259A registers. Our thanks to Stephen Baumgartner, not only for the fix,

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Figure 1: A program by Stephen Baumgartner to debug DEBUG.

```
1. Insert a diskette containing DEBUG

2. Type:  DEBUG DEBUG.COM <CR>

          (version 1.1):                    (version 2.0):
          E 119 B0 01 <CR>                  E 139 30 2F <CR>
          E 155 00 1B <CR>                  E 1B4 30 2F <CR>
          E 7C8 E1 1A <CR>                  E 8A4 18 2F <CR>
          E 1AE1                            E 2F18

          (both versions):
          9C 50 B0 0B E6 20 E4 20 24 03 58 75 04 9D E9

          (version 1.1):                    (version 2.0):
          1F ED                             C4 D9

          (both versions):
          9D CA 02 00 <CR>

       3. Insert a diskette on which to save the modified version

       4. Type:RCX <CR>
          (version 1.1):                    (version 2.0):
          1A00 <CR>                         2E30 <CR>
          N DEBUG2.COM <CR>
          W <CR>


notes:  *<CR> means press the "enter" key
        *Entries are given for either DEBUG version 1.1 or version 2.0.
         Type only the entries for the version you are editing, and all
         entries labeled "both versions". Do not press "enter" except
         where indicated.  The last edit in Step 2 should be typed as
         one continuous line (with a space between each pair of entries).
        *The revised version is saved as DEBUG2.COM in step 4.  You may,
         of course, use any other name you wish - just remember that it
         must be a COM file and the changes are in the new file, not in
         your original copy of DEBUG'
```

Figure 2: The new code used in Stephen Baumgartner's debug program.

```
PUSHF           ;save needed registers
PUSH  AX
MOV   AL,0B     ;query command 8259-A
OUT   20,AL     ;send command
IN    AL,20     ;read status from controller
AND   AL,03     ;see if high priority interrupts are in service
POP   AX
JNZ   1AF2      ;2F29 for 2.0      yes - keyboard is locked out
POPF
JMP   811       ;8ED for 2.0     no - usual single step handler
POPF
RETF  2         ;return to complete high priority interrupt
```

but for DOS 1.1 and DOS 2.0 versions.

Keyboard Redefinition, Continued

Kenneth Wood's reply to a letter by Michael Trombetta (page 56 of PC, Volume 2 Number 4) is a little incomplete. Mr. Trombetta wants to redefine the plus (+) key on the keypad to a comma (,) and wants the alteration to be effective in BASIC. As Mr. Wood recognizes, both the PC-DOS 2.0 key reassignment and Wood's own programs translate the ASCII code from (+) to (,). This not only alters the (+) key on the key pad, but also the (+ =) key on the top row of the keyboard, leaving the user with no way of accessing the plus character. A translation of the keyboard scan codes will allow a separation of these two keys and get the desired result of a comma on the key pad and a plus on the top row. The enclosed program listing (see Figure 3) accomplishes this by inserting a few lines into the ROM BIOS code for Interrupt 9. This method makes key reassignment available to all programs that use the BIOS routines for keyboard input, including BASIC.

Incidently, one can also redefine the left shift key separately from the right shift key in much the same manner. This allows the switching of the infamous left shift and backslash keys. For a more detailed explanation, see the article "Using IBM's Marvelous Keyboard," by David Glasco and Murray Sargent (BYTE, May 1983).

Robert L. Welch
Lexington, Kentucky

Fools Rush In. . .

Regarding the tip entitled "Restoring Erased Files" (see "User-to-User" PC, Volume 2 Number 3), I offer the following information.

The method described does NOT recover erased files. All it does is "recover" the directory entry for the file. It does not recover the space used by the file; that is, the file itself.

The directory entry for a file contains a pointer to the first "cluster" of sectors (one or more) used by the file. The balance of the space allocated to the file is kept track of in the File Allocation Table (FAT). Since the space assigned to a file does not have to be contiguous, the FAT contains a series of pointers chained together that allow PC-DOS to find the next cluster for the file until an end-of-file pointer is reached.

I tested the "fix" described under both PC-DOS 1.1 and 2.0 because I was suspicious of the method. When you ERASE a file, the FAT is updated immediately, the sectors that were assigned to the file are freed and the FAT is written back to the disk.

So, even if you perform no operations on the disk and you reboot the system, the sectors that were assigned to the file are no longer assigned to it; after you make the change to the directory entry with DEBUG, the disk is still in error. You have a file with no clusters (sectors) assigned to it and CHKDSK will verify that the file is bad. That is, the file name in the directory has been "recovered" but the file has not. The FAT would have to be updated (re-

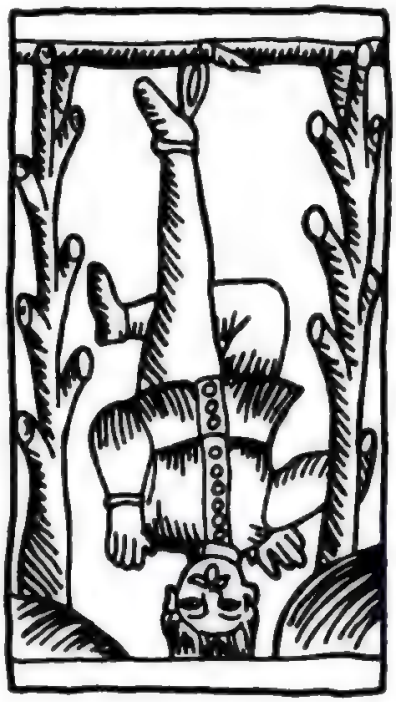
Figure 3: A listing of a program by Robert L. Welch that changes the plus (+) key on the keypad to a comma (,) without changing the plus/equal (+ =) key on the top row of the keyboard.

```
090E:0100 EB3E          JMP     0140        ;skip to initialize INT 9 pointer
090E:0102 FB            STI                 ;copy lines 1797 - 1807 of ROM - BIOS
090E:0103 50            PUSH    AX          ;on pages A-25 and A-26 of Technical
090E:0104 53            PUSH    BX          ;Reference Manual
090E:0105 51            PUSH    CX
090E:0106 52            PUSH    DX
090E:0107 56            PUSH    SI
090E:0108 57            PUSH    DI
090E:0109 1E            PUSH    DS
090E:010A 06            PUSH    ES
090E:010B FC            CLD
090E:010C B84000        MOV     AX,0040
090E:010F 8ED8          MOV     DS,AX
090E:0111 E460          IN      AL,60
090E:0113 50            PUSH    AX
090E:0114 E461          IN      AL,61
090E:0116 8AE4          MOV     AH,AL
090E:0118 0C80          OR      AL,80
090E:011A E661          OUT     61,AL
090E:011C 86C4          XCHG    AL,AL
090E:011E E661          OUT     61,AL
090E:0120 58            POP     AX
090E:0121 3C4E          CMP     AL,4E       ;test for '+' key on keypad
090E:0123 7502          JNZ     0127        ; if not, then do not alter scan code
090E:0125 B033          MOV     AL,33       ;change scan code to "," key
090E:0127 86C4          XCHG    AH,AL       ;save scan code in ah
090E:0129 EA03E9A9F0    JMP     F0A9:E903   ;go to ROM to finish INT 9
090E:012E 90            NOP
090E:012F 90            NOP
090E:0130 0E            PUSH    CS          ;put code segment in DS reg ster
090E:0131 1F            POP     DS
090E:0132 BA3301        MOV     DX,0133     ;offset byte of translation code in DX
090E:0135 B82525        MOV     AX,2525     ;use DOS function 25 to set INT 9
090E:0138 CD21          INT     21          ;pointer to DS:DX
090E:013A BA3001        MOV     DX,0130     ;add translation code to DOS and allow
090E:013D CD27          INT     27          ;new programs to load after DS:130
```


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stored) with the appropriate chain of cluster numbers in order for the file to be intact.

For those people who attempt to recover their files using the method you published, CHKDSK will repair the damage to the disk as follows: Under PC-DOS 1.1, CHKDSK uses the old first cluster pointer in the directory entry for the file to recover the first cluster (in my case, 2 sectors) of the file; the balance of the file, if any, is NOT recovered. Under PC-DOS 2.0, CHKDSK with a "/F" parameter changes the first cluster pointer to zero and recovers nothing. In both cases the FAT and the directory are consistent and the integrity of the disk is restored. Because CHKDSK under PC-DOS 2.0 does not try to recover any of the file, I have a hunch that there may be problems behind the fact that the PC-DOS 1.1 version of CHKDSK did try to recover files.

As you noted, the practice of writing absolute sectors to a disk is dangerous at best, particularly with the directory. Even an experienced user risks losing an entire disk for the sake of trying to recover one file if a mistake is made in specifying the rewrite of the sectors. I am delighted that you made the point you did to caution your readers.

Leland C. Sheppard
Redding, California

Thanks for confirming my suspicions. When there are fine products like The Norton Utilities *available, why mess around? Another reader, John Byrne, sent a lengthy (three pages, single spaced) description of how to check and restore the FAT entries with DEBUG. His conclusion after all the gory details? Use Norton's UNERASE. But here is his technique, for those of you with self-destructive urges.*

In the "User To User" column in PC, Volume 2 Number 3, there was an article about recovering erased files. I would like to point out that the method described will not ensure that the file will not be erased with a later save of another file and

THE INTERVALS are just long enough to lull you into an innocent sense of progress before the next crash.

that only a maximum of 512 bytes (1 sector) can be retained. What is described is a method to restore the directory entry, not the restoration of the file. The directory entry contains the location of the first sector. To find the next sector one must look at the File Allocation Table (FAT). If the FAT contains a number for the directory entry, this number indicates the next sector for the file. If it contains hex "FFF", it indicates that the sector just read is the last sector in the file; if it contains "000" it indicates that the sector is not in use. When PC-DOS erases a file, it puts an "e" in the first letter of the file name in the directory and also puts "000" in all FAT entries for this file. The method described

Figure 4: James F. Reidy's BASIC program to set top, bottom, and left margins for the NEC 8023 printer.

```
100 LPRINT CHR$(27);"L";"008" 'Set left margin to 8
110 WIDTH "LPT1:",255         'Disable width
120 LPRINT CHR$(29);          'Start VFU
130 LPRINT "A@";              'Set top of form in line 1
140 FOR N=1 TO 106
150   LPRINT "@";             'No tabs next 53 lines
160 NEXT
170 LPRINT "C@";              'Set bottom to line 55
170 FOR N=1 TO 22
180   LPRINT "@";             'No tabs next 11 lines
190 NEXT
200 LPRINT "A@";              'Next top of form
210 LPRINT CHR$(30)           'End VFU
220 WIDTH "LPT1:",80          'Restore width
```

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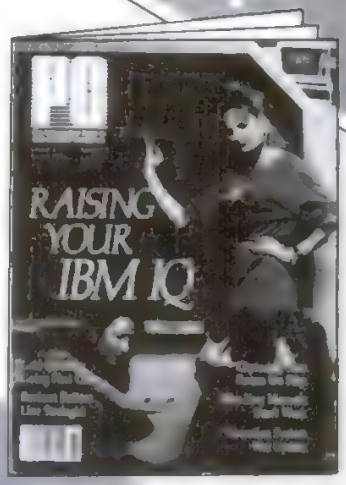
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in the article only restores the directory, but still leaves "000" in the FAT table. PC-DOS sees this as an unused sector and will write over the contents on a future save.

This can be illustrated with an example. Create two files with the PC-DOS editor, EDLIN. Call the first file TESTA and on line 1 of TESTA write "line 1 TESTA" then space over the space bar to the 79th column. On line 2, space over the space bar to the 79th column. Lines 3 and 4 should be the same as line 2. On the fifth line write "line 5 TESTA" and space over to the 79th column. Make the sixth, seventh, eighth, and ninth lines like line 2. On the tenth line write "line 10 TESTA" and space over to the 79th column. The file should look like the following:

```
1    line 1 TESTA
2
3
4
5    line 5 TESTA
6
7
8
9
10   line 10 TESTA
```

The blank lines all have 79 spaces in them. The purpose of the spacing is to fill up the line to create a file of about 720 characters so that it takes up 2 sectors (512 bytes in each sector). Now save this file with the EDLIN E command.

Now create the second file with EDLIN and call it TESTB. It's important that TESTB be created after TESTA. TESTB will be created the same way as TESTA and should look like the following:

```
1    line 1 TESTB
2
3
4
5    line 5 TESTB
6
7
8
9
10   line 10 TESTB
```

The blank lines in TESTB should also be spaced over 79 columns just as in TESTA. If TESTB was created after TESTA it should come immediately after TESTA in the DIR listing. Now perform the PC-DOS command "TYPE TESTB" and you observe what appears under the text portion above. Now do the command "ERASE TESTB" and TESTB should be eliminated

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from the directory listing. Now reconstruct TESTB according to the directions given in "Restoring Erased Files" (see "User-To-User" *PC*, Volume 2 Number 3). Now perform the PC-DOS command "TYPE TESTB " and the following should appear:

```
line 1 TESTB



line 5 TESTB
```

followed by approximately 200 bytes of garbage.

What has happened is that only the directory has been reconstructed, which contained only the first sector (512 bytes). PC-DOS goes to the FAT to find the next sector and finds neither the next sector nor "FFF" (indicating the last sector). Instead it finds "000", which says the sector just read is not in use, so for the remaining approximately 200 bytes it prints out nonsense.

We will now try to save another file to disk. Do the DOS command "EDLIN TESTA". This will create a new edited TESTA as well as the BAK file. While in EDLIN type on line 1 and 10 following the text that is already there "second save". Save this file with the EDLIN E command. Now go back to TESTB and see what's there by entering the "TYPE TESTB" command. The following should be observed:

```
line 1 TESTA second save



line 5 TESTA



line 10 TESTA second save
```

TESTB has now become TESTA and the one sector of TESTB that was reconstructed has been wiped out. The following has taken place. EDLIN always creates a backup copy with extension BAK for any edited file. The backup is the original, and the edited version becomes the new file that EDLIN creates. In our case the BAK is the original TESTA file and the new TESTA gets placed in the first available sector. PC-DOS looks to the FAT for the first sector that has "000" in it. In our case this happens to be the first and only sector for TESTB. PC-DOS writes over TESTB with the new TESTA data. We now have two file entries, TESTA and TESTB, with the same data and using the same sectors. Erasing either one will wipe out the data for both.

To recover a file that is many sectors long, one must first restore the directory as described in the earlier "User-To-User" article. Then you have to write the first sector to memory—presumably to CS:0100 if you are using DEBUG. Now you must use a translation of the first sector entry in the directory to point to the second sector in the FAT. This second sector must be written to memory immediately behind the first sector. To determine the next and succeeding sectors you go to the next entry in the FAT that contains "00". Now examine the contents of this sector to see if it is an entry in the file you are trying to recover. If it is, then save it as before. The process is repeated until all the sectors are recovered. Now use the name command to name the file for DEBUG and enter the number of bytes to be written in register CX.

If this sounds complicated, it's because it is. Although this can be done with DEBUG, a much simpler way is to use a utility such as Norton's UNERASE. This makes the recovery a breeze.

John J. Byrne
New Canaan, Connecticut

NEC Vertical Tabs

Anybody with an IBM PC who has tried to use the Vertical Form Unit of the

Figure 5: A solution to the difficult-to-read "filename.LST" file, by Jean Pickett.

```
10 REM: PROGRAM NAME:   LISTLST.BAS
20 REM: PROGRAMMER:     JEAN PICKETT
30 REM: LANGUAGE:       IBM DISK BASIC
40 REM: CREATION DATE:  13 AUG 83
50 KEY OFF:CLS:PRINT TAB(26);"* * * LISTLST.BAS * * *
60 PRINT:PRINT "this program lists a filename.LST file created by the IBM MACRO
Assembler to
70 PRINT "the printer in 132 characters per line mode.
80 LOCATE 10,30:PRINT "INPUT FILENAME:"
90 LOCATE 12,30:INPUT F$
100 CLS:LOCATE 10,20:PRINT "SET PRINTER TO TOF AND PRESS 'RETURN'"
110 IF INKEY$<> CHR$(13) THEN 110
120 OPEN F$ FOR INPUT AS #1
130 ON ERROR GOTO 220
140 CLS:LOCATE 10,25:PRINT "PRINTING FILE: "+F$
150 LPRINT CHR$(15);
160 LINE INPUT #1,D$
170 IF D$="" THEN LPRINT:GOTO 200
180 IF ASC(D$)=9 THEN D$=RIGHT$(D$,LEN(D$)-7):GOTO 20
190 LPRINT
200 LPRINT D$;
210 GOTO 160
220 CLOSE #1
230 END
```


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NEC 8023 printer has found that the directions in the NEC manual do not work. This is because the IBM PC has a default width of 80 columns, which must be disabled.

I have found that the following BASIC program (see Figure 4) will set the top, bottom, and left margins. I have included it in my AUTOEXEC.BAT file for the disk I use for writing BASIC programs:

James F. Reidy
Thousand Oaks, California

IBM's Secret RAMdisk

Although much has been written about DOS 2.0 since its announcement, I've not seen any mention of a "freebie" included in the DOS 2.0 manual. I use DOS 2.0 regularly, and I like it a lot.

I refer to the *Sample Device Driver* listed on pages 14–27 through 14–34 of the manual. It provides an emulated diskette drive with an address one beyond the number of drives indicated by the system board switches. While this drive may not be used in FORMAT or DISKCOPY commands, it works beautifully in all other functions.

Taking advantage of this "freebie" costs an hour or so, provided one already has the Macro Assembler and DOS 2.0. After entering the program as listed into a disk file, it is assembled using the Macro Assembler, linked by the linker, and converted into an xxxx.COM file via EXE2BIN. Then, a CONFIG.SYS file must be created (or modified) to include a DEVICE=xxxx.COM command.

Once this is done, an emulated disk (RAMdisk) will be available for immediate use whenever DOS is booted. It offers all of the advantages of any RAMdisk program I've heard of, and none of the disadvantages (except the previously mentioned DISKCOPY exclusion).

David F. McManigal
Stormville, New York

IBM's RAMdisk is part of my standard system, too. It's no better or worse than any other memory drive, but it's convenient to have it available through CONFIG.SYS. I have no lingering doubts about DOS 2.0 compatibility, as was the case with some of the other RAMdisk software. And you can't beat the price.

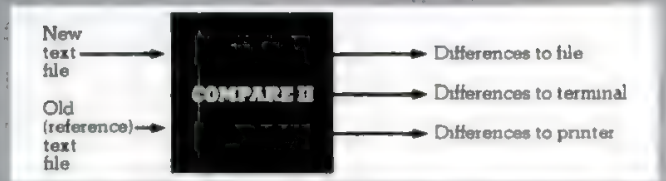
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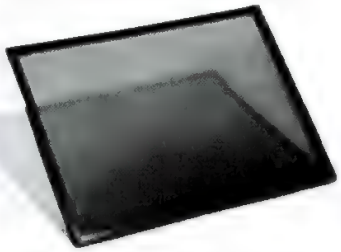
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Figure 6: The FULLBACK.BAT batch file by Ronald G. Parsons deletes .BAK files left around by his word processor.

```
.FULBACK.BAT

del \sw\*.bak

cd \

assign

pause Put first volume of full backup disk in A:

backup c:\ a:/s

basica \basicfil\logback
```

Figure 7: ENDOFDAY.BAK by Ronald G. Parsons backs up those files that have changed since the last backup.

```
.ENDOFDAY.BAK

del \sw\*.bak

cd \

assign

pause Put last volume of incremental disk in A:

backup c:\ a:/s/a/m

basica \basicfil\logback
```

Figure 8: The LOGBACK.BAS file by Ronald G. Parsons.

```
5 'LOGBACK.BAS

10 OPEN "logrec" FOR APPEND AS #1

20 INPUT "Type volume name of incremental backup diskette: ";A$

30 PRINT #1,DATE$;"   ";TIME$;"   Incremental disk backup on ";A$

40 CLOSE #1

50 SYSTEM
```

Figure 9: The LOGREC.BAS file by Ronald G. Parsons.

```
5 'LOGREC.BAS

10 INPUT "Type your name or initial, then RETURN: ";A$

20 OPEN "logrec" FOR APPEND AS #1

30 PRINT #1,DATE$;"   ";TIME$;"   ";A$

40 CLOSE #1

50 SYSTEM
```


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RO Assembler to the printer, you have probably noticed how confusing it is to read. This is due to the fact that only 80 characters fit on one line; the extra characters are wrapped around to the next line.

At first glance, it looks like switching the printer to 132 characters per line mode will do the trick. This is easy; just type MODE LPT1: 132 from PC-DOS. Now we can COPY filename.LST LPT1: and . . . well, it is in 132 chars, but the lines are still wrapping around.

An easy solution to this, in BASIC, is shown in Figure 5. (Type in the program and save it using SAVE "LISTLST".) To run the program from DOS, type BASIC LISTLST. Or if BASIC is already loaded, type RUN "LISTLST". The program will respond: ENTER FILESPEC. Type the filespec to be listed and press return. The program will issue the next prompt: SET PRINTER TO TOF. Manually set the printer to the top-of-form, if it is not there already, and press return. At this point the program will list your file to the printer and return to BASIC.

Jean Pickett
Trenton, New Jersey

Jean's solution works well enough, but is necessary only if you are printing a .LST file that someone else created. When assembling your own, just use the PAGE x,y pseudo-op. The first parameter is the number of lines per page, the second is the number of columns per line. PAGE 60,132, for example, formats each page to 60 lines and allows a width of 132 characters.

Put a FULLBACK On Your Team

Elsewhere in this issue is an article on tape backup systems. For those of you with PC-DOS 2.0 and hard disks who are not ready to take the plunge for a tape unit, here is a reasonable approach to backing up your hard disk with a minimum of pain.

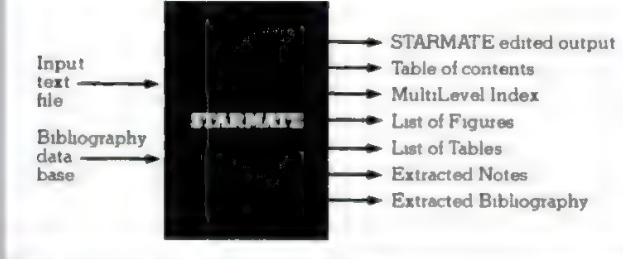
I have been using the following backup procedures with my PC XT for some time now and it has kept me from making (actually, repeating) some rather serious errors. There are two batch files: one used to create a full fixed disk backup and the other used for daily incremental backups of the files modified that day. There are also two short BASIC programs which are used to keep a log of all signon and backup activity. These programs write lines onto the end of a file LOGREC. I also use this file for other record keeping purposes such as hardware and software changes. I print this file and delete the disk copy every month or so.

The first batch file (I named it FULLBACK.BAT) deletes any .BAK files left around by my word processor (SuperWriter) so I don't waste space backing them up (see Figure 6). The root directory is made up of the current directory, and any assignments to alternate drives are cancelled. The backup command backs up all fixed disk files in all directories to the A: diskette. BASIC is then called to append a

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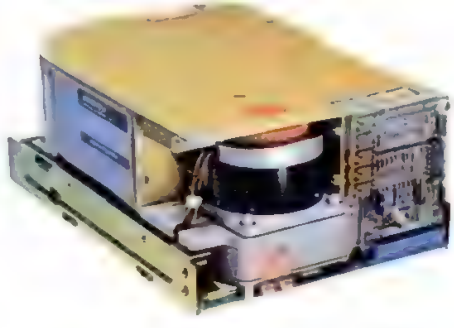
If you buy an IBM XT, it's going to cost you $4,995 for the XT system unit. You'll get 10 megabytes of hard disk storage, one 320 Kbytes floppy disk drive, 8 slots, a $120 asynchronous communication adaptor, 128K of RAM and the three IBM intials.

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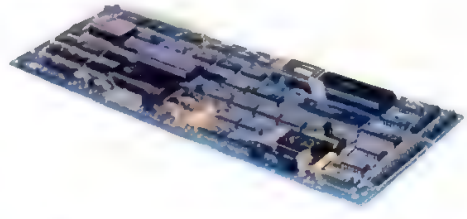


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line to LOGREC to time stamp and document the backup.

The second batch file (I named it ENDOFDAY.BAT, as it is usually used at the end of the day's work) is similar to the first except that it backs up only those files which have changed since the last backup and appends those files onto the end of the existing files on the backup diskettes (see Figure 7).

The file LOGBACK.BAS executed at the end of each backup run is shown in Figure 8. It opens the file LOGREC and writes the date, time, and diskette identification onto the end of LOGREC.

USING backup procedures with my PC XT has kept me from making and repeating some rather serious errors.

I call a similar program called LOGREC.BAS (see Figure 9) from the AUTOEXEC.BAT file. It opens the file LOGREC and writes the date, time, users initials plus any other useful information onto the end of LOGREC.

Consistent use of the procedures has encouraged good backup procedures and has avoided mistakes such as leaving an "assign a=c" active and backing up the fixed disk on top of itself.

Ronald G. Parsons
Austin, Texas

Handicapped Keyboards, Continued

Like Anthony Sebastian who uses bags of shot for weights (see "User-to-User," *PC*, Volume 2 Number 4), I can only press one key at a time because of my disability. At my suggestion, RoseSoft has produced a version of ProKey for handicapped users that totally eliminates the need to use multiple keys.

This special ProKey "remembers" the Ctrl, Alt or Caps shift keys until after a subsequent nonshift key is struck. Thus, any multikey combination can be expressed by a sequential series of single keystrokes. For example, you can reboot the system from the keyboard by pressing and *releasing* Alt, followed by Ctrl, followed by Del.

Note that any multikey combination can be entered in this fashion. Unlike the Caps Lock key, the Alt, Ctrl and Caps keys do not stay "locked." A shifted state is active for one character only, much like the escape sequence used to control a printer. This means you don't have to remember if shifts are on or off.

One-fingered mode can easily be switched off if your system is used by someone else who does not need this feature. Switchability will be useful in electronic offices with disabled workers, schools with disabled students and other shared systems.

Any keyboard enhancer can improve user productivity. However, only ProKey 3.0 unlocks the IBM PC keyboard for handicapped users who have problems with multiple keys. It is available from RoseSoft for the price of the regular ProKey. Get rid of those bags of shot, Anthony. You need ProKey 3.0.

Michael Falconer
Madison, Wisconsin

Thanks for the stimulus, Mike. Eileen Rose and company are to be commended for their responsiveness. Building this feature into a product like ProKey makes the most sense of all, since it gives disabled users the sequential keying they need plus all the power of ProKey.

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Note: In the interest of accuracy, we will gladly accept—even encourage—submissions containing program listings on disk. PC will return or replace a disk, at your request. If you send us a disk, please include a printout of your submission to ensure against damage in transit.

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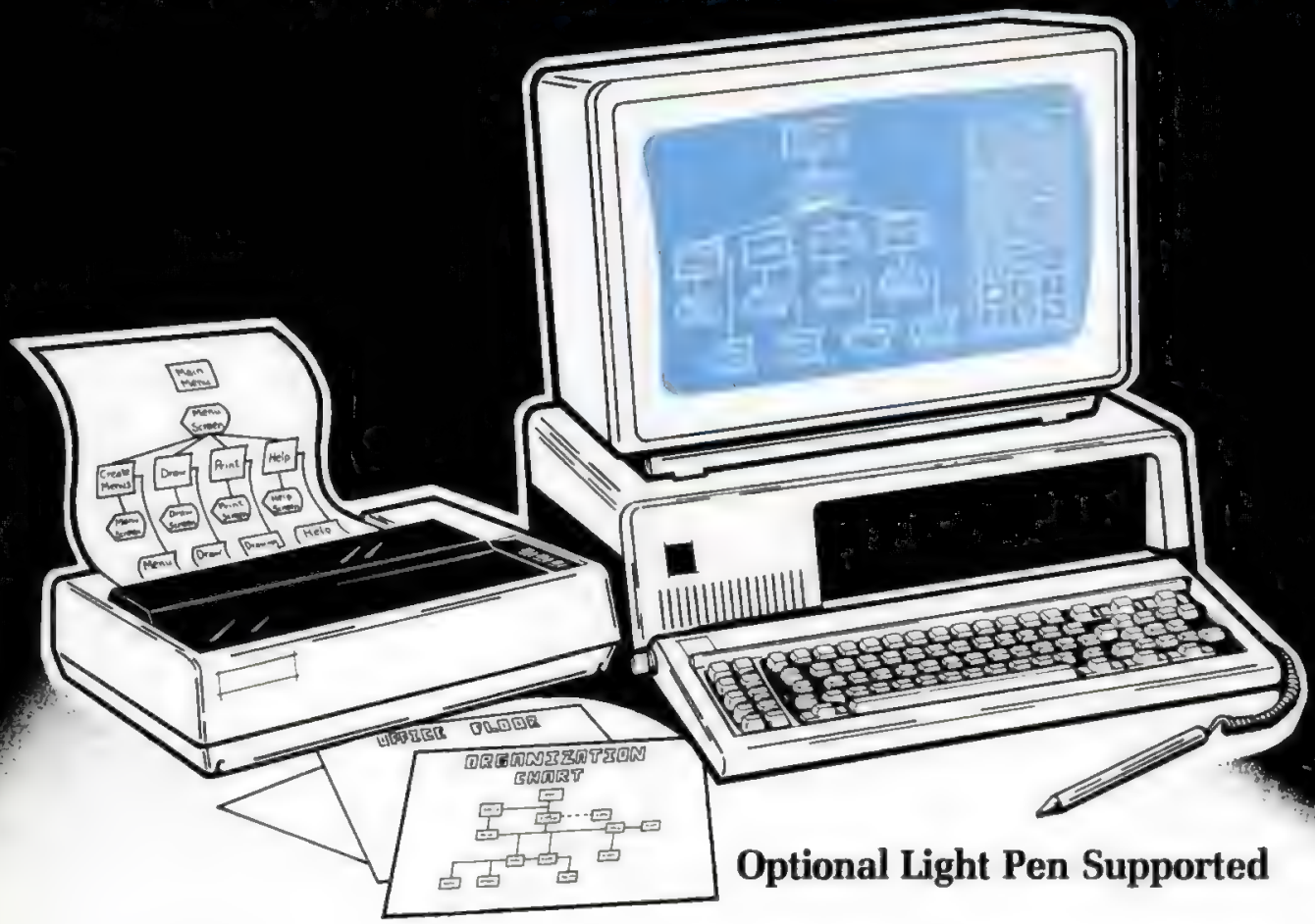
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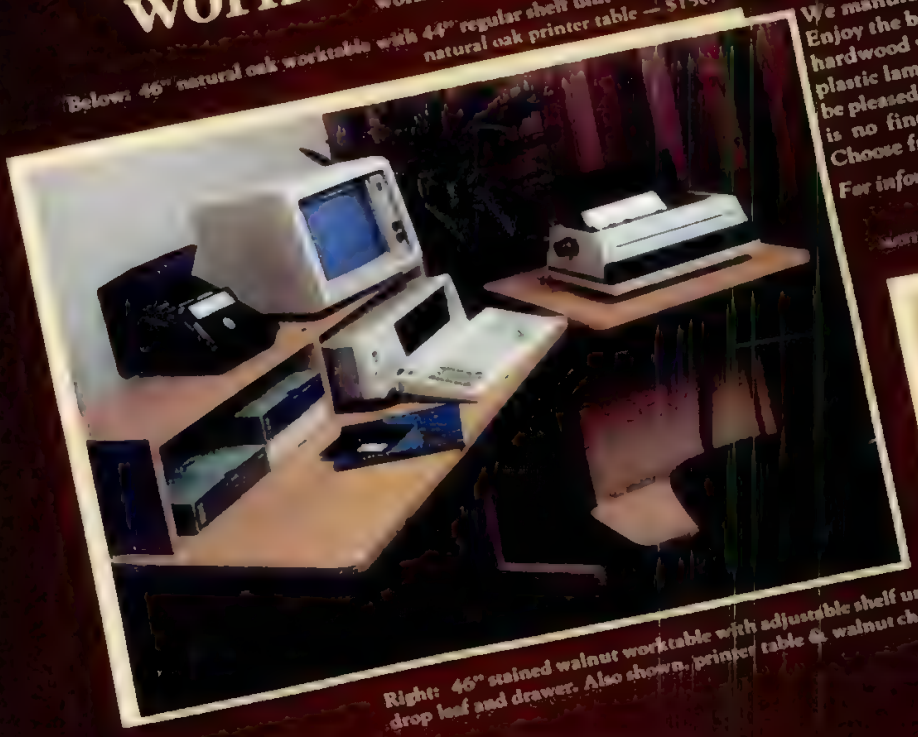
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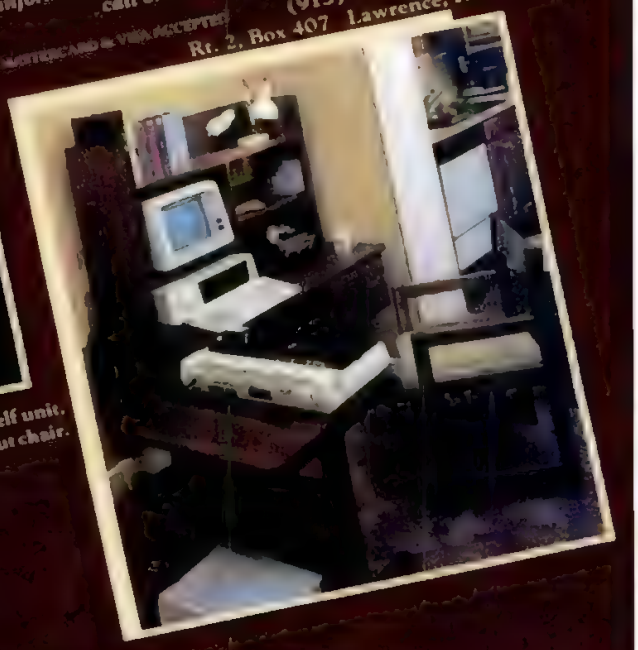
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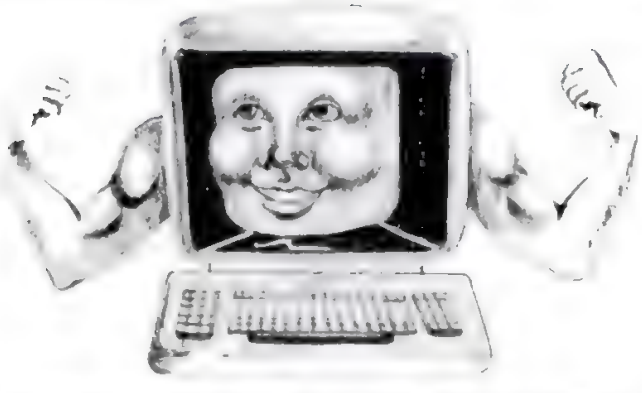
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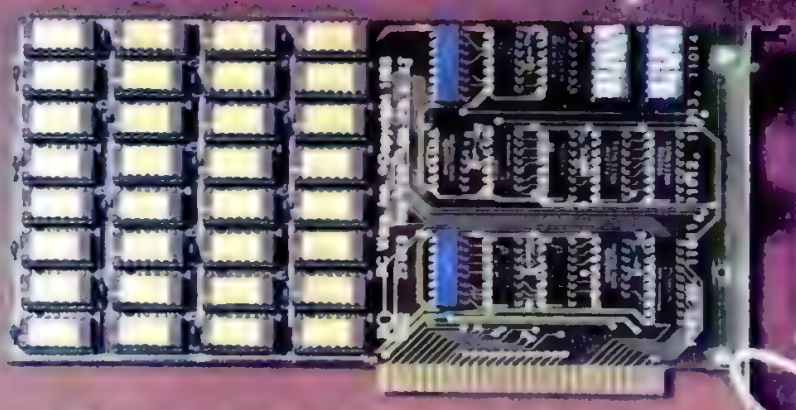
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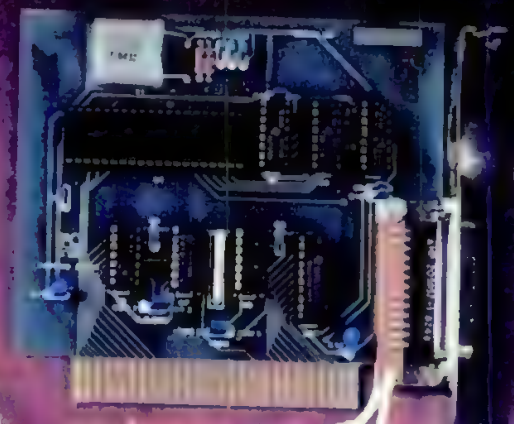
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2	509	Book Excerpt	IBM PC Graphics Primer, Part III	Waite, Mitchell	Morgan, Christopher L.
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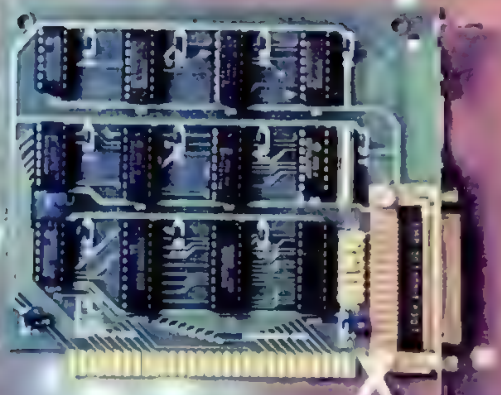
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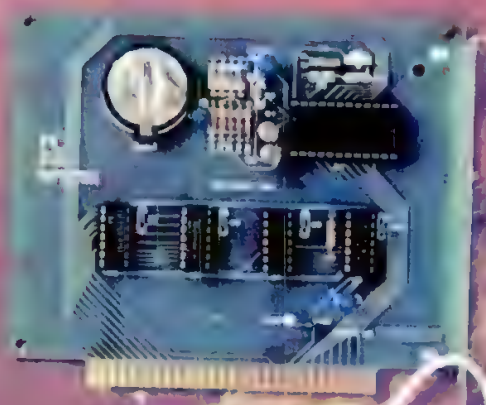
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CIRCLE 417 ON READER SERVICE CARD

In a precedent-setting lawsuit, the court, defining an operating system as a "literary work"—and therefore copyrightable—favors the plaintiff.

Apple vs. Franklin

Stephen A. Becker is a patent attorney with the law firm of Lowe, King, Price & Becker. His specialty is protection of intellectual property innovations, with particular emphasis on computers.

PC introduces Stephen Becker's new column, a forum for the discussion of legal issues as they pertain to the computer services industry.

More than 20 manufacturers are currently marketing PC-compatible computers. So far, IBM has looked benignly upon this proliferation of lookalikes, but a recent court decision in favor of Apple may change IBM's thinking on the matter.

Chip copiers beware. Numerous so-called Apple-compatible computers have been marketed in this country by both foreign and U.S. companies. Some of these second-source computers are legal versions of the parent machine, emulations that are created by writing original object code to bring into the machine essentially the same operating system provided in the parent machine. Others, however, are direct copies, or knockoffs.

In its Ace 100 "Apple-compatible" computer, Franklin Computer Corporation, a small Philadelphia-based company, copied 14 operating system programs embodied in ROM (or floppy disk) in the Apple II. Apple brought a suit against Franklin in the District Court for the Eastern District of Pennsylvania. (This is a lower federal court to which copyright cases are originally brought; appeals from this court proceed to the Court of Appeals for the Third Circuit and then to the Supreme Court.) The suit charged Franklin with, among other things, copyright infringement of the 14 operating system programs. Apple requested action (preliminary injunction) by the court to stop Franklin from infringing the copyrights during the litigation on the grounds that Apple would suffer irreparable harm by Franklin's continued copyright infringement while the case was before the court.

That Franklin admitted to copying does not imply that the company did not consider writing its own operating system programs. Testimony revealed that David McWherter, now Franklin's vice-president of engineering, spent 30 to 40 hours in November 1981 determining the feasibility of writing an original Apple-compatible Autostart ROM program. He determined that to ensure 100 percent compatibility with Apple programs, the operating system would have to perfectly mesh with programs designed to run on the Apple,

and he concluded that "there were just too many entry points in relationship to the number of instructions in the program." During the case, Apple introduced evidence that Franklin could have rewritten the Autostart ROM program as well as the other 13 operating system programs, pointing out that other companies have already written operating programs compatible with Apple II.

Franklin's defense was that copying the operating system programs was not illegal because Apple's programs are not copyrightable. Therefore, Apple's 14 copyright registrations are invalid and unenforceable. Franklin's theory was based on three principal grounds. First, although source code is definitely copyrightable, object code is not. While source code is "a literary work" written to be comprehended by a human being, object code is not; it is designed to be read only by a machine. Therefore, by nature, it is not copyrightable.

Second, even if object code were copyrightable, object code embodied in an ROM chip would not be, because the chip is part of the machine. The proper mode of protection, if any, would be patent, not copyright. Finally, operating system programs, regardless of the language or medium in which they are fixed, are utilitarian, not expressive, and therefore not copyrightable.

SOME SECOND-source computers are legal versions of the parent machine.

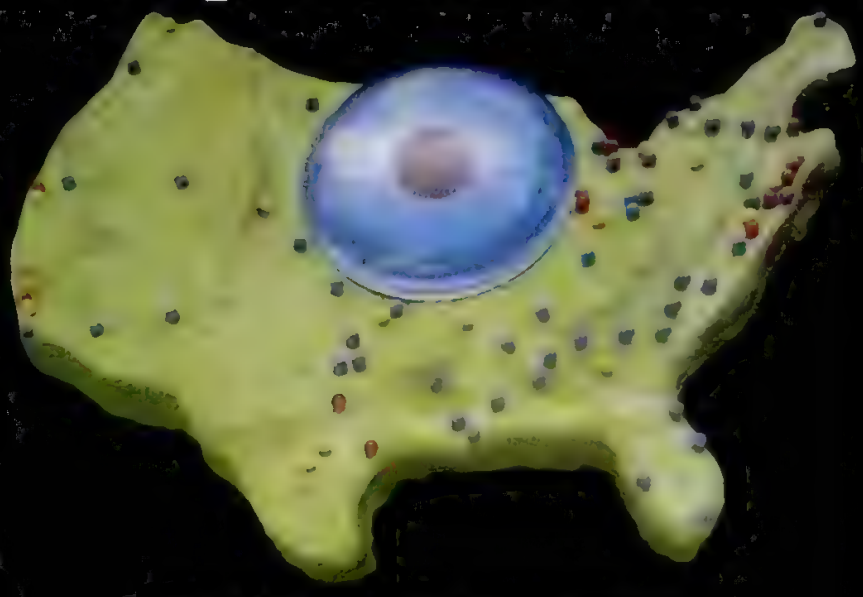
Franklin appeared to be on weak ground; the majority of computer programming copyright cases being handed down from other courts were in favor of software protection. Unknown to Franklin, the Third Circuit Court of Appeals was about to issue a decision upholding the copyrightability of object code in a video game case, a strong precedent for Apple.

Injunction Initially Denied

The District Court surprised the computer industry. It refused to grant Apple's request for a preliminary injunction on the grounds that it had some doubt as to the copyrightability of operating system programs, and furthermore, "Apple is better suited to withstand whatever injury it might sustain during litigation than is Franklin to withstand the effects of a preliminary injunction, because injunction would have a devastating effect on Franklin's business."

Apple appealed the District Court's decision. Rallying for Apple were Digital Research, Inc., MicroSoft Corporation, and the Association of Data Processing Service Organizations, Inc. (ADAPSO), all

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of which filed briefs with the Court of Appeals in support of Apple's position. Only Pro-Log Corporation filed a brief in partial support of Franklin. During this period, there was considerable uncertainty in the industry. However, sales of Apple-compatible machines were increasing. For instance, Franklin reported sales of $44,000,000 during the past 12 months. In addition, there are estimates that counterfeiters in Taiwan and Hong Kong have produced somewhere on the order of 10,000 Apple clones.

On August 30, 1983, the Court of Appeals rendered its decision on the side of Apple. Granting the preliminary injunction to Apple, Judge Sloviter, speaking on behalf of the court, pointed out that the Copyright Act, upon which all copyright decisions are based, makes no distinction between applications programs (which are copyrightable) and operating programs. The court pointed to a number of recent court decisions supporting copyrightability of object code and operating programs, including one case that characterized object code as a protectable translation or derivation of copyrightable source code. In its reasoning, the court stepped through the arguments raised by Franklin. Judge Sloviter rejected the theory that object code is not copyrightable because it is not designed to be intelligible to human beings. By definition, a literary work is not confined to the likes of Hemingway's *For Whom The Bell Tolls*. The term *literary works* includes expressions not only in words but also in "numbers or other numerical symbols or indicia," Judge Sloviter explained. The Court of Appeals thus considers a computer program, written in object code or source code, to be a "literary work," which is therefore protectable from unauthorized copying.

With respect to the argument that object code embedded in an ROM chip is part of a machine and therefore not copyrightable, the court reviewed that language of the Copyright Act and concluded that copyright laws specifically provides protection for "literary works" embodied in *any manner* capable of being reproduced by a machine.

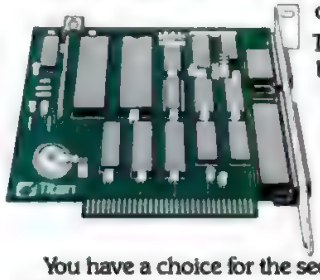
Finally, the court rejected Franklin's

THIRD parties have already written their own Apple-compatible operating system programs. Franklin made a business decision to copy rather than rewrite.

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CIRCLE 802 ON READER SERVICE CARD

argument that operating system programs, regardless of how they are written or embodied, are not copyrightable because they are functional. The court's reasoning was divided into two parts. First, the court determined that the Copyright Act makes no distinction between applications programs and operating programs. In other words, an operating system program, per se, is not precluded from copyright. The court ruled that there is no distinction, in the copyright sense, between one set of instructions to the computer and another. That is, an applications program (for example, one that helps its user prepare an income-tax return) is no different from an operating system program (*AppleSoft* DOS, for example) that translates a high-level language from source code into binary language object code. Second, the court considered whether the Apple II operating system instructions are tied to the function of the Apple II computer, or whether the two can be separated. In other words, can two different sets of instructions be written for the same Apple II operating system? If the answer is no, the program isn't copyrightable.

Remember what was learned during the testimony of the case? Third parties have already written their own Apple-compatible operating system programs. Franklin made a business decision to copy rather than rewrite. The court held out for Apple.

Reactions

The preliminary injunction against Franklin having been granted, the case has now been sent back to the District Court to resolve a number of remaining issues. As a practical matter, it is unlikely that Apple will lose this case, even if Franklin appeals an ultimate adverse decision by the District Court.

Although a few analysts have played the court decision down, Apple considers it "a victory not only for the company, but for the computer services industry." Albert Eisenstat, the general counsel for Apple, said, "Franklin is going to have to do something more than freeload off our stuff." Franklin plans to appeal, but, in any event, it anticipates only a negligible effect on business. Its next step may possibly be to shift away from Apple compatibility. A spokesman for ADAPSO believes, "the ruling is definitely a weapon against piracy and a legal remedy for those who have been victimized so far." And a spokesman for IBM applauded the ruling, stating that any decision that supported copyright protection for software was welcomed.

As a practical matter, the IBM PC market may not be significantly affected by the court ruling. IBM has in the past widely publicized the IBM operating system to encourage third parties to develop additional applications for the machine. Furthermore, although there are some PC knockoffs, most IBM lookalikes use emulations, not copies, of the PC operating system. Nevertheless, the *Apple v. Franklin* decision may bring new thinking to IBM and other manufacturers, which can now more confidently look to the courts for protection. */PC*

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68000 Co-Processor with RM COS. Sritek

68000 Co-Processor with RM/COS

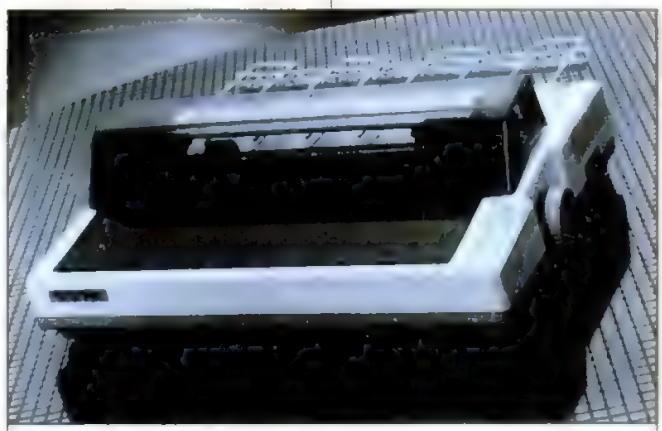
A 68000 based plug-in board that converts a user's system into a COBOL-oriented, multi-user system. The board incorporates RM/COS, a multi-tasking operating system designed specifically for developing and executing COBOL applications.

The board's 68000 microprocessor is designed to take over central processing functions, allowing the user's 8088 processor to act as an I/O processor. When configured with a 256K add-on memory module, the board/operating system combination can handle up to four users. The 8088 attends to all I/O processing tasks such as handling multiple terminals, disk I/O with disk/track caching, as well as Local Area Network and remote batch processing protocols. The 68000 supports system software and user applications.

The 68000 board is available to operate at 8 or 10 MHz, and can be used under PC-DOS, allowing a user to run software available for systems with only the 8088 processor. *(List Price: $2,495; with 256K module $2,995)*

Sritek Inc.
10230 Brecksville Rd.
Cleveland, OH 44141
(216)526-9433

CIRCLE 682 ON READER SERVICE CARD



Riteman Printer, Inforunner

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XCOM Modem and CROSSTALK-XVI

An internally-mounted serial communications board. The XCOM Modem includes *CROSSTALK-XVI* communications software, which can emulate several kinds of intelligent terminals when accessing a remote host, and which transfer files with error-checking protocol to other *CROSSTALK* systems.

The XCOM Modem can automatically place and answer calls using parameters that need be set only once. Future calls to the same system can be made with a single keystroke. The unit allows the user to store up to 40 separate function key definitions for each system to be accessed.

The device is compatible with Bell 103/113 and 212A-type modems communicating asynchronously at speeds of 300 or 1200 baud. *(List Price: $449)*

Requires: 96K, one disk drive, PC-DOS.

XCOM
3213 Ramos Cir.
Sacramento, CA 95827
(916)366-7071

CIRCLE 681 ON READER SERVICE CARD



XCOM Modem and CROSSTALK-XVI, XCOM

PCnet

A hardware/software package that allows up to 128 users to link their systems into a common local area network. The hardware consists of a single-slot PCnet Adapter board that plugs into each user's system. The board incorporates a plug for 75-ohm coaxial cable that can run up to 7,000 feet. The setup provides a data transmission speed of one megabit per second.

Each Adapter comes with software that integrates the network with PC-DOS (MS-DOS). The DOS interface is designed to allow single-user applications to run without disconnecting from the network. The software also allows for disk sharing, file locking (restricting access to a file to one user at a time), multi-tasking, and printer sharing functions. The multi-tasking feature allows a user to run commands on another system by remote. Thus, one system can act as an "execution server" for the other systems and can print files, assemble programs, and format text while the others perform different work. *(List Price: Adapter Card $765; Two-system starter kit $1,529)*

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(408)287-4640

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P-Series Disk Controller

A single-card disk controller that emulates the IBM disk controller instruction set, while providing growth potential for expansion outside IBM-defined commands. The card incorporates a microprocessor and can support two ST 506 Winchester disk drives. It includes error detection with eight-bit error correction capability, 512K sector sizes, and a user-programmable interleaving.

Other features of the disk controller card include an expansion board form factor; I/0 channel plug compatibility; multiple sector read/write operations; and consecutive physical sector operations. The card has an on-board socket and decoding software for an eight-byte boot EPROM. *(List Price: $395)*

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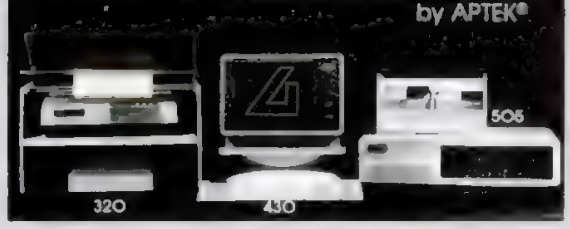
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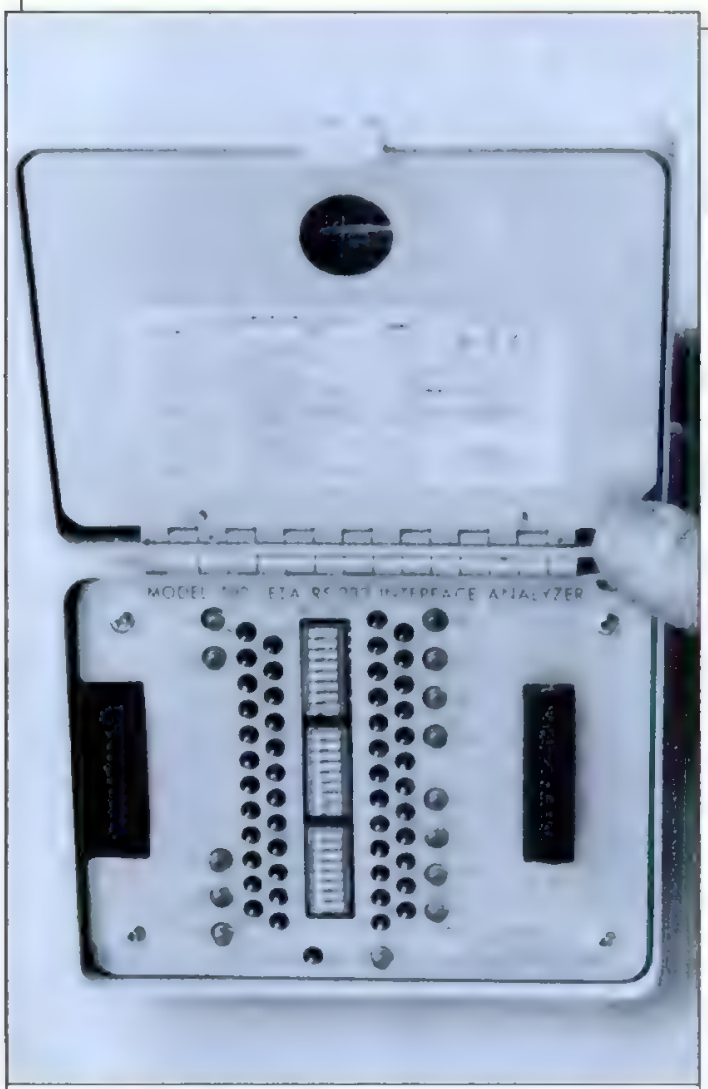
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New On The Market



Model 700 RS-232 Analyzer, Electro Standards Laboratory

Model 700 RS-232 Analyzer

A diagnostic tool for use at EIA RS-232 or CCITT V.24 data interfaces for modems, multiplexers, or other peripherals requiring a serial I/0 line. The device is inserted in series between the user's system and the peripheral. A separate cable allows the Model 700 Analyzer to be connected at either the microcomputer or peripheral end of an interface circuit.

The unit provides 24 mini-switches, allowing a user to program a 'make' or 'break' for each signal at the interface. Mini-patchcords are provided for cross-patching or loopback patching of signals at the front panel test point array. Three-state L.E.D.s indicate the interface's key signal polarities, activities, and validity.

A table of EIA/CCITT standard interface signal descriptions is provided inside the unit. The Model 700 is battery powered and is packaged in an aluminum case. *(List Price: $275)*

Electro Standards Laboratory, Inc.
P.O. Box 9144
Providence, RI 02940
(401)943-1164

CIRCLE 686 ON READER SERVICE CARD

The ADS-8212 Data Exchange/64

An interface converter and print spooler. The unit, which incorporates an 8039 microprocessor and 64K RAM, allows input and temporary storage of data directed to an attached peripheral. Subsequent output of the data can be in any of a number of user-selectable forms. Selectable data transmission variables include: serial port baud rates from 50 to 19.2K; data I/0 in either serial or parallel configurations; and incoming and outgoing protocols for RDY/BSY, XON/XOFF, and ETX/ACK.

The unit includes self-diagnostics. When powered up, the device will verify that it is functioning with an L.E.D. indicating "ready." A reset button purges the buffer memory of previous contents, and a "Buf Full" L.E.D. comes on when the unit halts the flow of incoming data.

A copy feature allows the unit to download the same data to a printer any number of times, without tying up the user's system.*(List Price: $329)*

Antex Data Systems
2630 California St.
Mountain View, CA 94043
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Data Exchange/64, Antex Data Systems

New On The Market

Polaroid Palette

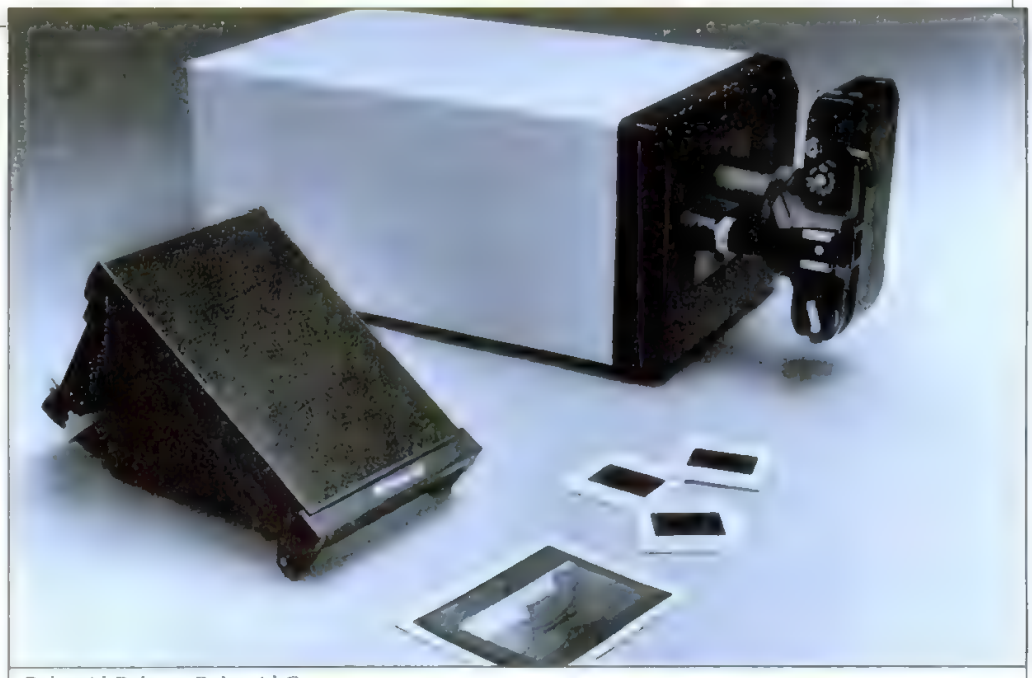
A computer screen image recorder that can produce color 35mm slides or instant prints from color or monochrome graphic images. The unit connects to a user's system by means of an RS-170 video line and an RS-232C serial line. Containing a flat-faced, 920 × 700 resolution screen with a three-color filter wheel, the Palette allows a user to produce photographic copies of screen images for presentations, display, record keeping, or working copies. The user's system and the Palette match exposure parameters to the film being used, while allowing the user to control color selection and location.

Polaroid Palette software, included with the unit, permits selection of colors from a total of 72 available, to change or add colors to the image on film. Users can manipulate the system to create an unlimited number of color sets to match or modify a given image's color arrangement. Images can also be captured on film without modification, and a fill technique is provided to eliminate raster lines.

The Polaroid Palette package includes a 35mm auto-advance camera back, Polaroid 35mm Autoprocess transparency development hardware, and a camera back for Polaroid 3¼ × 4¼ inch instant print film.*(List Price; Unavailable at press time)*

Polaroid Corp.
575 Technology Sq.
Cambridge, MA 02139
(617)577-2000

CIRCLE 684 ON READER SERVICE CARD



Polaroid Palette, Polaroid Corp.



Graymatter 10, IQ Systems

Graymatter 10

0A Winchester hard disk drive with 10Mb storage capacity, featuring a built-in tape cassette backup. The unit offers both streaming tape mode and a start/stop mode, permitting automatic backup of data files as data is entered into the user's system, or backup of all data at one time, respectively. Other features of the Graymatter mass storage device include an erase facility, enabling users to eliminate sensitive or obsolete data quickly from both the hard disk and backup tape, allowing reuse of tapes.

Each Graymatter 10 system kit includes operating software, adapter card, and user's manual. *(List Price: $3,995)*

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Anaheim, CA 92806
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Requires: 128K, two 320K drives, PC-DOS, monitor.

CPAids
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THE CREATOR, Software Technology

THE CREATOR

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New On The Market

Pathway Communications Software

A series of communications programs allowing users to tie their systems into IBM mainframe communications networks of either System Network Architecture (SNA) or Binary Synchronous Communication (BSC). The *SNA-3270* and *SNA-3770 Emulators*, used in conjunction with the Pathway Communications Adapter, enable the user's system to communicate with host systems by emulating IBM 3270 or 3770 terminals, respectively. The software, written in "C" language, provide cluster controller support, SNA character stream, as well as 3270 Terminal support and data stream compatibility. Peripheral services can be supported for concurrent operations, and security algorithms for data encryption/decryption are included. User facilities include status line messages and state indicators, access to other system utilities, and user-definable function keys.

The *BSC-3270* and *BSC-3770 Emulators* are similar to the *SNA* software, with features including on-line trace and error logging, switched and leased lines (NRZI), multi-point and point-to-point support, and local data capture for transmittal to/from host system.

The *Pathway 2780/3780 Emulator* package offers similar capabilities as the *SNA* and *BSC* packages, and includes command file for unattended operations, data transparency, data compression/decompression, printer forms control, operator selectable I/O devices, and Remote Job Entry console support.

The manufacturer offers a lifetime warranty on all software packages. *(List Price: SNA Series $595; BSC Series $495; 2780/3780 $495)*
Requires: 128K, two disk drives, PC-DOS, monitor, modem, Pathway Communications Adapter.
Pathway Designs, Inc.
177 Worchester St.
Wellesley, MA 02181
(617) 237-7722

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Communications Package, Pathway Design

Material Optimization & Selection

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A scaled down version of the *VEDIT* text editor program. *MINI VEDIT* can be used as a program development aid or for simple word processing. The program provides the user with unlimited file handling, "cut and paste" operations, a range of cursor controls, search and replace functions, tabbing and automatic indenting. *(List Price: $49)*
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CATALOGER can also automatically create and maintain a volume catalog, storing the volume name, description, disk size, disk space used, and date cataloged. Display capabilities of the software include the master catalog file, which can be sorted by name, extension, date and volume name.

The *CATALOGER* can print the master catalog file in specified sorted order, and all the files in a catalog can be printed or only those for a specific volume name.

The software is menu-driven, and the size of the catalog file depends upon the amount of internal memory in the user's system. *(List Price: available from manufacturer)*
Requires: 96K, two disk drives, PC-DOS 1.1, 80-col. monitor.
PPS
P.O. Box 3487
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Pear Portfolio Management System

A portfolio management program that organizes transaction data into two sets of files: one for security information, the other for portfolio position information. The program assigns internal identification numbers to entered data, allowing the user to enter information once to update every portfolio in which the data appears. Features of the *Pear Portfolio Management System* include tax-lot accounting of buy and sell transactions, automatic or manual pricing of securities, and the ability to store up to 100 portfolios on a single diskette. *(List Price: $695)*
Requires: 128K, two 320K drives, PC-DOS, monitor, printer.
Remote Computing Corp.
1076 E. Meadow Cir.
Palo Alto, CA 94303
(415) 494-6111

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A real estate valuation and analysis program which can facilitate discounted cash flow forecasts for 5 to 50 years. The program automatically calculates the effects of lease rollovers including new base rents, new escalation provisions, leasing commissions, and tenant improvements for an unlimited number of leases. The program features prompts in common English and multiple choice menus. *(List Price: $1,495; demo disk $50)*
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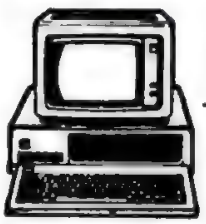
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programs, and uses a Client Name Code as the primary key for searching the database files. Two-level password security is provided, and the program can produce a variety of different reports, including ACORD forms and insurance certificates. *(List Price: $399.95)*
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Versions are of the program are currently available for *VisiCalc* and *Lotus 1-2-3*. *(List Price: $199)*
Requires: 128K, two disk drives, PC-DOS 1.1 or 2.0, monochrome or color display, printer.
Solutions By Example, Inc.
Box 307
New Town Branch
Boston, MA 02258
(617) 244-5880

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People Literate Software

Three programs for homes or small businesses to aid in the solution of financial problems. The first, *Time Value of Money*, solves mortgage, annuity, present worth, and gradient analysis problems in an interactive screen format. Each analysis allows the user to calculate any one of the four unknowns in these types of problems, given the other three. Details such as amortization tables are available for any analysis on the screen, or they may be written into a file for use in a document.

The *Itemizer* program is designed to help track expenses and income of all types. The user can define up to 90 categories that will hold records of financial transactions which can be entered at any time, in any sequence. Transactions consist of a memo, or a description area, an amount area, a subtotal memo area, and a subtotal. Subtotal areas are optional and may be calculated at any point within a category. Categories may be viewed in detail or summary form on the screen, may be routed to a printer, or written into a file.

The *Money Manager* program can be used as a two-column spreadsheet for tracking and projecting expenses and incomes throughout the year on a month-by-month basis. Incomes or expenses appearing in several months need to be entered only once and then moved to the other months. The program shows month, year, and year-to-date totals, updated as new entries are made.

The *Itemizer* and the *Money Manager* programs allow the user to select the keys used to move the cursor, and also provide protection in the form of an automatic backup system and an "Oops" key, which can be used to undo the last change made. All three programs contain help facilities that can be used at any point in the programs. Most commands can be made with a single keystroke. The programs are self-contained, and do not require additional spreadsheets, templates, or other programs to operate. *(List Price: $39.95 each; all three programs $99.95)*
Requires: 96K, one disk drive, PC-DOS or CP/M-86.
People Literate Software
P.O. Box 2039
Bozeman, MT 59715
(406) 586-1581

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INFIDEL

An adventure game program set in the vast Egyptian desert somewhere near the banks of the Nile. The player and his party are ill-equipped for an expedition of the magnitude necessary to easily accomplish the player's goal. Tempers flare. Relations deteriorate. When local workers are forced to work on a Holy Day they rebel, leaving the player stranded.

The game challenges the player to find the buried entrance of the last great pyramid and, once inside, to unravel a passage through a series of rooms and chambers filled with traps. The prize is the pyramid's hidden treasures, untouched for thousands of years.

INFIDEL is written in INTERLOGIC, a proprietary development system that allows the player to communicate with the game in common English. The game recognizes a 600-word vocabulary, covering every aspect of game play. *(List Price: $49.95)*
Requires: 64K, one disk drive, PC-DOS, monitor.
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A collection of routines that use applied geometry to solve land surveying and civil engineering problems. *The Traverse Boundary* program examines the measurements of a closed geometric figure and determines if it is complete and consistent. If the figure is not closed, it will suggest which measurements might be off and where problems may lie; it will also attempt to balance the figure. Among the options offered within the program are Crandall's Rule, Compass Rule, or no adjustment.

The Coordinate Geometry program uses a closed figure as a reference for establishing other locations, both inside and outside the figure, that are in turn used to design a sub-division or to find actual ground locations. It contains over 75 routines devoted to various possibilities that can exist, including bearing; North azimuth; included or deflected angles; side shots, both normal and by inverse; and 90 degree offsets.

Besides the ability to clear and move points, the *BENCHMARK System* provides auxiliary routines to enable the user to determine which points are used and which are free. Utilities are also provided to handle culs-de-sac, street intersections, and lot design. *(List Price: $1,500)*

Requires: 64K, two disk drives, PC-DOS.

The Computersmith
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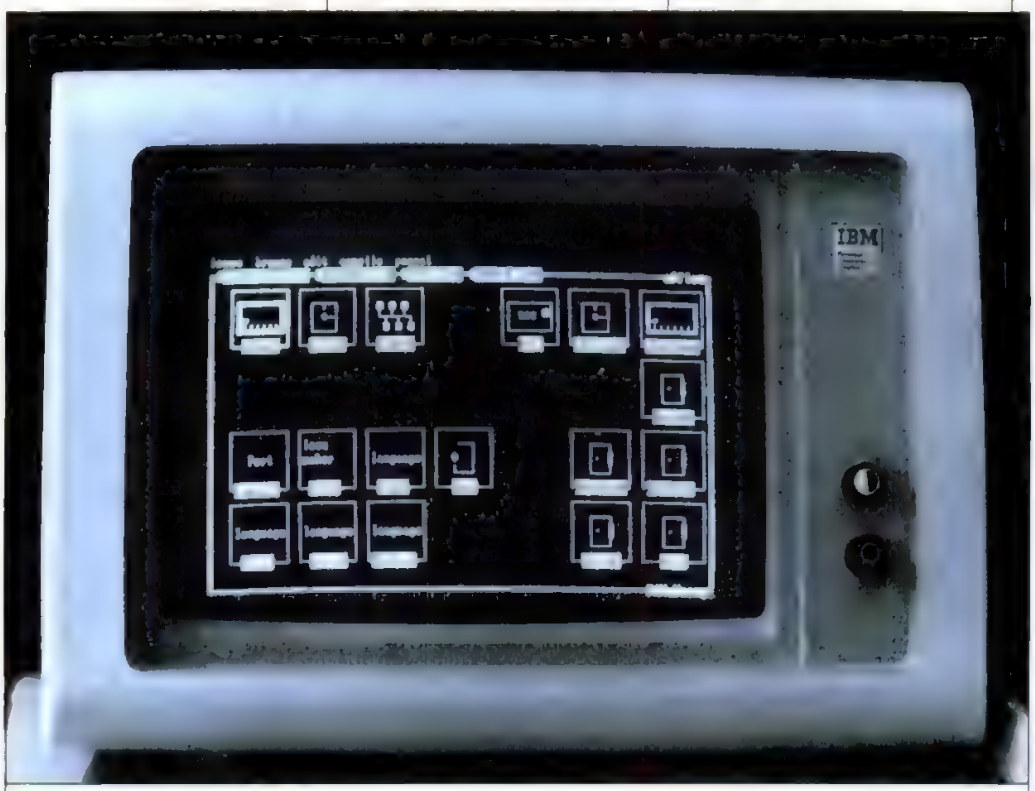
An operating system/software development system that can be used by a single user's system or in a local area network setup. As a software development system, *Port* includes several language processors, applications programs, and an integrated set of development tools.

The *Port* operating system version features capabilities including multiple windows; support for input and pointing devices such as mice or digitizing tablets; a tree-structured file system; and a browser for the file system, and for the network of which the user's system may be a part. It includes a full-screen mouse-oriented editor and can handle multiple processing, as well as inter-process message passing between systems linked together. *(List Price: Operating System version $500; Development System version $750)*

Requires: *OS version:* 192K, two disk drives, monitor; *Development System version:* 512K, two disk drives, monitor.

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The game includes a beginner's mode, which provides answers to problems, and a drill mode that allows any one number to be used as the basis for all problems, facilitating the learning of a particular math table. Sound can be turned on or off, and the speed of the game can be adjusted to allow more time to solve the problems presented in the game. Upon return to base, a Mission Log reports overall score and indicates missed problems. This Log can be outputted to a printer for hardcopy of results. *(List Price: $44.95)*

Requires: 64K, one disk drive, PC-DOS, color monitor, color/graphics adapter.

Brauer Computer Support Education Div.
P.O. Box 86634
San Diego, CA 92138

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Rainbow Writer Color Text Formatter

A utility program for printing color text and graphics on users' systems equipped with Prism Printers. *Color Text Formatter* can be used with any word processor using ASCII format files. Over 60 commands are provided for the following capabilities: color text, with or without graphics; true proportional spacing; setting margins; pagination; forward page referencing; wordwrap; mail merge; table of contents with page numbers; index with page numbers; variable character size and spacing; variable form length; multiple copies; conditional processing; page headers and footers; and other features. All values are expressed in inches. *(List Price: $149)*

Requires: 64K, two disk drives, PC-DOS, IDS Prism printer.

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80 Townsend St.
Pepperell, MA 01463
(617) 433-5201

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A financial reporting program that can produce accounting statements and graphic charts of business data. *Snapshot* can create income statements, balance sheets, cashflow reports, and financial ratio analysis reports, using a fixed spreadsheet format. In graphics mode, the program allows a user to graph the last 12 months, quarters, or years of any spreadsheet item. *(List Price: $150)*

Requires: 90K, one disk drive, PC-DOS.

Snapshot
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(703) 979-3595

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VisiCalc IV

A new release of the *VisiCalc* spreadsheet program, featuring expanded capabilities for graphics, sorting, spreadsheet management, and user-defined commands. Graphics capabilities include eight graph options for converting spreadsheet data into graphical format. Complex or special graphs created through keyboard commands programmed by the user can be stored on disk and later recalled with a single keystroke. *VisiCalc IV* graphs can be printed in standard or large sizes; standard or reverse image; and in standard or 90-degree rotated orientation. Available primitives include area, bar, dot, pie, scatter, and line, as well as more complex graphs such as high/low/close and stacked/comparative bar. Both color and monochrome graphics are supported.

The new release's enhanced sorting and rearranging capabilities provide spreadsheet management capabilities by treating the spreadsheet as a database. This allows the user to generate custom reports, as well as standard financial models. Sorting can be performed on rows, or on subsets of rows up to the spreadsheet's capacity of 254 rows. Columns can be quickly rearranged in any order, allowing a user to generate historical performances or current projections quickly.

The Keysaver command feature enables the user to store a series of *VisiCalc* commands and operations under any single key, including function keys. Up to 66 user-defined commands can be stored in any single file. *(List Price: $250)*

Requires: 64K, one disk drive, PC-DOS, monitor, printer.

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New On The Market

PC/BANKER-CEO Farm Finance Module

A financial data management program designed for farms and farm-related business. The program is used in conjunction with the *Lotus 1-2-3* spreadsheet program (supplied) to produce a data-gathering form that can be used to assemble the necessary facts to generate financial statements. Reports generated by the *Farm Finance Module* include:

- a 12-month Cash Flow Projection, based on income and expenses;
- Loan Balance Projections by month as well as by peak loan periods;
- an Earnings Statement;
- a Financial History to track the progress of the user's business, which can be generated from the Financial Statement and Earnings Worksheet with a single keystroke.

The program includes source code for modifying the *Lotus 1-2-3* templates. *(List Price: $750, including 1-2-3)*

Requires: 192K, two 320K drives, PC-DOS, monitor, printer.

Response, Inc.
P.O. Box 66
608 Second St.
Jackson, MN 56143
(507) 847-2700

CIRCLE 714 ON READER SERVICE CARD



The Media Director I & II, Anderson Assoc.

The Media Director I & II

A program designed for radio stations, advertising and marketing agencies, and other businesses with an interest in maintaining data on radio time and comparative values. *The Media Director* software allows a user to enter basic data obtainable from rating services, such as Arbitron and Birch, to calculate and compare the following indices: Average Persons Rating, Cume Persons Rating, Share of Audience, Gross Ratings Points, Gross Impressions, Cost of Schedule, Cost Per Gross Rating Point, Cost per Gross Impression, Cost Per Thousand Net Reach, Average Frequency, Average Time Spent Listening, and Turnover Rate.

The program can create the indices reports for an unlimited number of radio stations within a given market for each report. Each version of *The Media Director* will create a file, and display, edit, print, and store a database for any market, time-of-day, and demographic group. *Version II* can also generate Reach + Frequency and Station Analysis by Daypart reports.

The software includes documentation and a walk-through tutorial. *(List Price: Version I $350; Version II $500)*

Requires: 64K, one disk drive, PC-DOS, monitor, printer.

Anderson Associates
4 Irvine Row
Carlisle, PA 17013
(717)245-2662

CIRCLE 696 ON READER SERVICE CARD

TOGGLE-KEY

A DOS extension which converts the CTRL, ALT, and SHIFT keys to toggle-like action similar to the NUM LOCK and CAPS LOCK keys. This facilitates system reset for users only capable of depressing a single key at a time. The software displays the Locked/Unlocked condition of the keys on-screen, and can be run simultaneously with most commercial applications software. *(List Price: $49.95)*

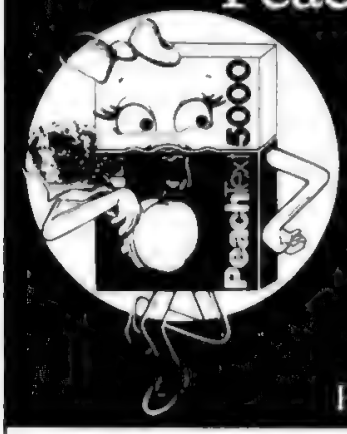
Requires: 64K, one disk drive, PC-DOS.

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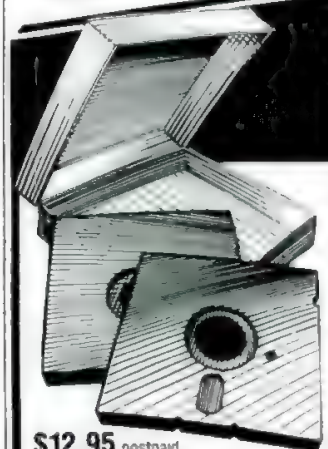
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New On The Market

ENICO

A geological structure contour mapping program. The software provides a database of well records that can be maintained on any number of diskettes. Contour maps can be generated from the database for structure, isopach, trend residuals, and net pay, with color-coded production zones. Full screen edit facilities allow quick entry and update of geological structure data and other information. Well locations are based upon the U.S. land survey system, allowing entry of a location by its legal call down to 2½ acres within a section or by feet from a section line.

Planned versions will incorporate non-standard survey methods, such as used in Texas, and also permit optional data entry by digitizer. A communications module is also planned, permitting data input from commercial databases. *(List Price: $12,670)*

Requires: 320K, two 320K drives, PC-DOS, RGB color monitor, color/graphics adapter, 80-col. printer, 8087 Math Co-Processor Chip, 8-pen color plotter.

ENP Software
1215 Ridgeoak Cir.
Sapulpa, OK 74066
(918) 227-1915

CIRCLE 744 ON READER SERVICE CARD



Waterloo Logo, Waterloo MICROSYSTEMS

Waterloo Logo

An implementation of Logo developed by the University of Waterloo, allowing any sequence of commands to be given a name and saved as a procedure, which can later be called forth by entering its name. *Waterloo Logo* includes 140 primitives, turtle graphics, screen editor, workspace management and list processing facilities, and defined function keys. The software includes facilities for creating music and graphics applications. *(List Price: $180)*

Requires: 128K, one disk drive, color monitor, color/graphics adapter.

Waterloo MICROSYSTEMS Inc.
175 Columbia St. W.
Waterloo, Ontario, Canada
N21 3B6
(519)884-3141

CIRCLE 698 ON READER SERVICE CARD

COST-ACUMEN

A cost accounting and project management program for architectural and engineering firms. The program is designed to operate on systems incorporating a Winchester disk drive with one megabyte or greater storage capacity. *COST-ACUMEN* allows a user to monitor and control operating costs, expedite invoicing, manage projects, analyze employee productivity and overhead contribution, and spot cost overruns prior to their occurrence. *(List Price: $995; demo $95)*

Requires: 128K, 1 Mb Hard Disk Drive, PC-DOS 2.0, monitor, 132-col. printer.

Computer Applications Corp.
Program Products Div.
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Memphis, TN 38112
(901) 458-8630

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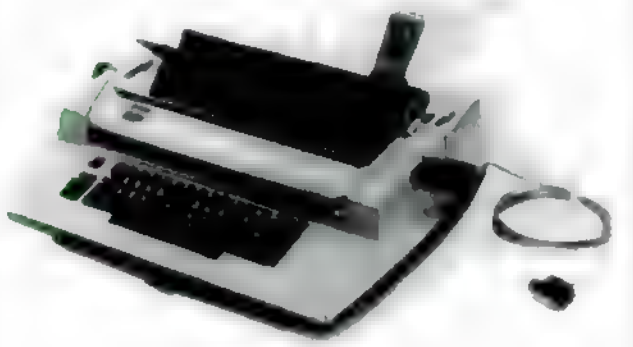
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The Logo language for the IBM®PC is here. **PC LOGO** is a full implementation of Logo including word and list capability as well as turtle graphics. Since **PC LOGO** incorporates much of the syntax of Logos available on other computers, it is easy to learn. Yet **PC LOGO** goes far beyond other versions of Logo by taking advantage of the extra features of the IBM PC including function and arrow keys and provides a greatly enhanced editor.

A complete tutorial for beginning users and a full reference manual have been written for **PC LOGO** by a consortium of Boston-based Logo experts.

PC LOGO features include:

- Program and Utility Disks
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Somerville, MA 02143
(617) 492-2999

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New On The Market

"BIG BLUE"berry Pie A La Mode

A BASICA language diskette containing 51 utility programs, three documentation files, and two data files which are called up by two BASIC programs, WORKFILE.BAS and TESTWRIT.BAS. The programs run the gamut from simple programming-aids to fully formatted Mail Label, Mailing List, or database management routines. Included are forms and arrays for use as accounting aids; a calculator program; a simple selective font word processor; a gasoline-mileage record form meeting IRS record-keeping requirements; a number of ASCII character printer-control routines; and graphic-character screen formatting routines.

Two versions of *"BIG BLUE"berry Pie A La Mode* are available: a 320K diskette with all routines, and a 160K diskette containing 41 routines. *(List Price: 320K version $19.95; 160K version $14.95)*

Requires: 64K, one disk drive, PC-DOS.

GINACO
10708 Santa Fe Dr.
Sun City, AZ 85251
(602) 972-5559

CIRCLE 741 ON READER SERVICE CARD

Interactive Church Information System

A church management program with provisions for managing such areas as membership rosters, contributions, funds accounting, planning, Minister's personal record keeping, church music selections, education, assets management, and administration. Features of the *Interactive Church Information System* include funds accounting, capable of generating reports on all church funds, including contributions and pledges; a membership database, including members' special interests, abilities, needs, activities, functions, etc.; a component to automate a Minister's appointment calendar, time management, personal library, sermon preparation procedures, card files, and prospect lists; a Church Education component for organizing classes, rosters, attendance records, and library records; a music component, organizing a church's sheet music, records and audio tapes, and hymns; and an administration package that includes the ability to generate mailing lists and labels, maintain a church directory, an activities calendar, tickler files, with word processing capabilities. *(List Price: $5,440)*

Requires: 128K, two disk drives, PC-DOS 1.1 (or 192K with PC-DOS 2.0).

AGC Corp.
170 N. Ocoee St.
Cleveland, TN 37311
(615) 478-3636

CIRCLE 732 ON READER SERVICE CARD



Interactive Church Information System. AGC Corp.

Merge 'n Print

A mail merge program adding merge capabilities to word processing and mailing list programs. *Merge 'n Print* is compatible with word processors such as *Easywriter (1.1 and II), Volkswriter, WordStar,* and the *Benchmark* programs; and with the mailing list facilities of such software as *dBASE II, T.I.M., PC Filer, VisiCalc, InfoStar,* and *Lotus 1-2-3,* and other programs creating files in DIF format.

Features of *Merge 'n Print* include keyboard insertion of data into form letters; insertion of variables into documents from a data file; capability of printing boilerplate paragraphs; and the printing of mailing labels. The program can send up to 1,200 form letters per data diskette. *(List Price: $145)*

Requires: 64K, two disk drives, PC-DOS.

MBS Software
12729 N.E. Hassalo St.
Portland, OR 97230
(503) 256-0130

CIRCLE 748 ON READER SERVICE CARD



VisiCalc Instruction, Little, Brown & Co.

VisiCalc Instruction

An instructional program in the use of the popular spreadsheet program, *VisiCalc Programming: No Experience Necessary* allows users to master *VisiCalc* in a matter of hours. The self-instructional guide and diskette interacts directly with the spreadsheet program to teach its use. A series of exercises provides immediate hands-on experience while the user builds a working *Profit Analysis* model.

In addition to the *Profit Analysis* model, five other model templates are included: *Time Management, Future Cash Flow Analysis, Portfolio Valuation, Retirement Planning,* and *Loan Repayment Scheduler.* A self-pacing Checkpoint system lets users correct errors or review any part of the tutorial program at any time. *(List Price: $59.95)*

Requires: 64K, one disk drive, PC-DOS, *VisiCalc.*

Little, Brown and Co.
200 West St.
Waltham, MA 02154
(800)343-9204
(617)890-0250

CIRCLE 700 ON READER SERVICE CARD

Screen Saver

A program to protect a user's video display screen against phosphor burnout, a permanent damage condition caused by leaving the same image on a screen for a prolonged period. *Screen Saver* blanks out a display after a user-programmable period of no activity at the keyboard.

Screen Saver operates independent of applications programs and operating systems. The program can be used with either monochrome monitors or color monitors with a color/graphics adapter.

The regular version allows a user to make back-up copies. A source code version is also available as a special order. *(List Price: $19.95)*

Requires: 64K, one disk drive, PC-DOS, monitor.

Logical Systems Corp.
Rte. 1, Box 253
St. Michael, MN 55376
(612) 497-3861

CIRCLE 716 ON READER SERVICE CARD

Home and Business Accounting Programs

Two financial accounting programs offering similar features and capabilities, one designed for home use, the other intended for small to medium-sized businesses. *The Accountant Finance Data Base System* is a double entry accounting program for home financial management. It allows a user to backdate transactions; to define accounts using common names instead of alphanumeric code; to print monthly summaries of accounts or groups of accounts; and to produce bar graphs and similar histograms of account activity. *The Accountant* also allows a user to post automatic transactions, and to define up to nine sets of these transactions, with up to 100 transactions per set.

The Business Accountant version includes additional reporting features, such as the ability to generate profit/loss statements and income/expense summaries for user-defined periods.

Both versions feature automatic account balancing and error-checking facilities, on-screen reports, and reports configured for 80 column printouts. For both versions also, interface modules are available allowing a user to tie data into spreadsheet programs such as *VisiCalc, Lotus 1-2-3,* and *Multiplan. (List Price: Home version $195; Business version $295; Spreadsheet interface modules $20)*

Requires: Both versions: 128K, one disk drive, PC-DOS, monitor.

Decision Support Software, Inc.
1438 Ironwood Dr.
McLean, VA 22101
(703) 241-8316

CIRCLE 742 ON READER SERVICE CARD

New On The Market

Solomon III General Ledger

A general ledger accounting program featuring graphic displays of data entry forms. Other features include user-definable chart of accounts, journal types, accounting cycles, budgets, and reports. *Solomon III General Ledger* allows for consolidation of multiple divisions or companies, as well as user-definable non-recurring, auto-reversing, and recurring transactions.

The software can accommodate account numbers up to 12 digits in length: six digits for master account, six for sub-account. Reports generated by the program include a ratio analysis listing of 20 common financial ratios. Audit trails are provided for all financial entries and non-financial account maintenance. *(List Price: $595)*

Requires: 256K, two disk drives, PC-DOS.

Computech Group Inc.
Main Line Industrial Pk.
Lee Blvd.
Frazer, PA 19355
(215)SOLOMON

CIRCLE 693 ON READER SERVICE CARD



Solomon III General Ledger, Computech

KONSCRIPT

A report writing program that accesses BASIC files (random or sequential) and produces reports designed by a non-technical user. The program can run alone, or can be included with a user's own applications. Features include: variable print-size, report-width, spacing, etc.; sorting by any field; any number of selection criteria; any number of print fields up to report width; user-defined mailing labels with variable width, depth, number of labels across, selective printing, variable format, etc.; and password security. *(List Price: $125)*

Requires: *Interpretive version:* 64K, one disk drive, PC-DOS, Interpretive BASIC. *Compiled version:* 128K, one disk drive, PC-DOS, BASIC Compiler.

Konnote Systems
P.O. Box 17039
Los Angeles, CA 90017
(213) 384-4644

CIRCLE 747 ON READER SERVICE CARD

QTIME

A database management system for the PC-XT, permitting users to custom-design applications without requiring knowledge of programming. *QTIME* is available in two versions, *QTIME Executive*, and *QTIME Designer*.

QTIME Executive can create a database with up to 65,535 indexed records, each record capable of up to 564 characters. Records can also be arranged sequentially, without limits on total number. The software can create mailing labels, custom reports and summaries, spreadsheet models, or graphs.

QTIME Designer is a more advanced version of the system, featuring software transportability to mainframe and minicomputer systems, advanced modeling, automatic file management capability, networking compatibility, and 150 system options including automatic factoring, automatic percent calculation, cross-referencing, renumbering, and reformatting of files.

Both versions are written in COBOL, and include help screens and a built-in tutorial and applications-building module called *LEARN*. *(List Price: Executive $695; Designer $995)*

Requires: Both Versions: PC-XT; 256K, Hard Disk, PC-DOS.

Quality Information Systems, Inc.
Honeywell Center, #505
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Atlanta, GA 30329
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ACCESSORIES

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A stand placing a user's keyboard below the surface of a work table, extending the work area. The stand is made of one-eighth inch anodized aluminum and is available in custom sizes and three colors: bronze, gold, and silver. *(List Price: $49.95)*

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A set of tab dividers for the IBM BASIC and DOS manuals furnished with a user's system. The 16 dividers show information summarizing the particular section that each tab references. The dividers provide a quick means of referencing the more than 150 commands, statements, and functions in the IBM BASIC manual.

Two versions are available for the DOS manuals, one for PC-DOS 1.0 and 1.1, and a set for 2.0. *(List Price: $9.95)*

Siechert & Wood Technical Publications
133 W. Colorado Blvd.
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A line of blank 5¼-inch diskettes in five colors. Each SPECTRUM Rainbow Pack contains two of each of red, yellow, orange, blue, and green diskettes. An additional range of five pastel colors is also available separately.

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A line of diskettes featuring pre-programmed PROLOK copy protection. Each diskette features a unique identification code, which the disk's program must search for before it can run on a user's system.

The PROLOK protection system allows backup copies of data stored on disk to be made, but backups cannot generate programs in themselves. Instead, they must be copied back onto the PROLOK diskette to run. The diskettes can be used in systems incorporating hard disks as well. *(List Price: $9.95 each)*

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New On The Market

Computer T-Shirts

A line of t-shirts reading "I (love) my IBM PC" across the front. The design is silk-screened in four colors on a light grey cotton/polyester t-shirt. *($8.99)*

The Point of It All, Inc.
5504-G Chapel Hill Blvd.
Durham, NC 27707

CIRCLE 754 ON READER SERVICE CARD



Computer T-Shirts, The Point of It All, Inc.

IPC Surge Suppressor

A surge suppression and noise filtering device, featuring a design allowing it to be used internationally. The device uses IEE-320/CEE-22 connectors for power input and output. The user matches the input cord to the country's power system.

The IPC Surge Suppressor provides six individually switched outlets in dual separately filtered banks of three each. Noise filtering is in five stages with both differential and common mode attentuation, providing up to 52dB insertion loss at 10 MHz. Surge suppression is accomplished in six stages with both differential and common mode protection.

A main input, international-standard connector is provided with the unit, as well as a master on-off switch and an external fuse. Two pilot lights indicate the differential and common mode protection status. The unit is rated for 10 amps maximum with 100 VAC to 260 VAC, 50 Hz or 60 Hz power sources. *(List Price: $150)*

Kalglo Electronics Co., Inc.
Colony Drive Industrial Pk.
6584 Ruch Rd.
Bethlehem, PA 18017
(215) 837-0700
TWX: 510-651-2101

CIRCLE 758 ON READER SERVICE CARD

PC jeans

A line of dust covers for a user's system, made of blue denim fabric. Two or three piece sets are available, for configurations with a monitor atop the systems unit and for configurations with remotely located displays. *(List Price: Two piece $29.95; Three-piece $34.95)*

J. Nichols
9083 Sunflower
Alta Loma, CA 91701
(714) 989-7138

CIRCLE 755 ON READER SERVICE CARD

ISOBAR

A surge protector and noise filtering device providing spike protection up to 2000 amperes, and high frequency noise protection. Filter banks isolate each outlet so that each load is protected against the other loads. The ISOBAR unit can handle a maximum load of 1875 watts, and starts suppressing spikes at 140 VAC. It is available with two, four, or eight outlets, and plugs into any standard 15-amp, 125 VAC outlet. *(List Price: 2-6 outlets $54.95; 4-6 outlets $79.95; 8-15 outlets $97.95)*

Indus-Tool
325 W. Huron
Chicago, IL 60610
(312) 642-6871

CIRCLE 752 ON READER SERVICE CARD



IPC Surge Suppressor, Kalglo



Freedom III, HSP Computer Furniture

HSP Freedom III

A computer workstation cabinet incorporating a lockable roll top design. The unit features an extendable keyboard support shelf, a locking rear access panel, a wire management tray, a storage shelf, and hooded casters. Available as options are a built-in multiple outlet, a disk drive shelf, and locking casters. *(List Price: $850; options $15-$40)*
HSP Computer Furniture
P.O. Box 5545
Birmingham, AL 35207
(205) 251-0500

CIRCLE 760 ON READER SERVICE CARD

1944-S Printer Stand

A slotted printer stand designed for the Okidata printers. The table surface features a 3½-inch by 18-inch cutout through which to feed paper to the printer. The 29-inch fixed black frame (27 inches high without casters) can accommodate an acoustical shield to minimize printer noise. *(List Price: $144)*
Royal Seating Corp.
P.O. Box 753
Cameron, TX 76520
(817) 697-6421

CIRCLE 751 ON READER SERVICE CARD

Electra-Guard System 2

A surge suppressor, rated at up to 15 amps at 120 VAC, that can handle up to six devices not exceeding 1875 watts. The unit provides line-to-line and line-to-ground clamping protection with a response time of less than five nanoseconds to overvoltage spikes and surges. The device is compatible with 50 Hz and 60 Hz AC power mains, and can work at temperatures from −20 to +90 degrees Centigrade (−4 to +194 degrees Fahrenheit). *(List Price: $49.95)*
Computer Power Solutions, Inc.
8800 49th St. N., #203
Pinellas Park, FL 33565
(800) 237-6010
(813) 544-8801

CIRCLE 759 ON READER SERVICE CARD

LinTek Monitor Mover

A monitor stand consisting of a heavy duty desk clamp, a 360-degree swivel base, a 15-inch vertically adjustable arm, and a CRT mounting tray that can swivel and tilt up to 15 degrees. The unit supports most monochrome and color monitors, allowing the user to position the display for comfort. The Monitor Mover also frees desk workspace previously occupied by the CRT. *(List Price: $129.95)*
LinTek Inc.
P.O. Box 8056
Grand Rapids, MI 49508
(616) 241-4040

CIRCLE 761 ON READER SERVICE CARD



Monitor Mover, LinTek Inc.

Copyri

New On The Market

PUBLICATIONS

BASIC Programming Primer

A second edition of the *BASIC Programming Primer* by Michael Waite and Michael Pardee, adding Microsoft BASIC and 16-bit BASIC statements to the first edition. The self-instructional format of the guide includes self-tests and answers. For clarity, there are working examples, like a loan amortization program and a metric conversion program. A BASIC language reference card (with nine printed panels and one blank), has been bound into the book, but can be easily detached.

The *BASIC Programming Guide* makes use of cartoons, photography, and color graphics in its gradual approach from simple statements to complex commands. Tips and techniques for professional program planning and coding are offered throughout the text. *($17.95)*

Howard W. Sams & Co., Inc.
4300 W. 62nd St.
Indianapolis, IN 46268
(317) 298-5400

CIRCLE 763 ON READER SERVICE CARD



BASIC Programming Primer, Sams & Co., Inc.

dNOTES, The International dBASE II User's Journal

A bi-monthly journal for users of specialized databases utilizing Ashton-Tate's *dBASE II*. Editorial focal areas include database management, applications and forms design, data entry programs, as well as information on new programs available and hardware.

The journal is intended as a permanent reference manual in process. Articles are indexed and printed on a pre-punched sheet for refiling, in a provided loose-leaf binder, into one of seven *dBASE II* reference sections. Sections include: dWORKS, covering applications; dSTUFF, for smaller programs and utilities; dPLOY, a guide to deploying databases; dVIEWS, devoted to product previews, reviews, and interviews with experts; dBATE, a forum column; dSOURCE, listing user groups and information sources; and dSOAP, a database melodrama and case history section.

dNOTES is a publication of I:D:E:A Industries, Inc., the parent organization of The Institute for Database Education and Application. *(Subscription Price: 12 issues, $44)*

I:D:E:A Industries, Inc.
1580 Woodvale Ave.
P.O. Box 86
Deerfield, IL 60015
(800) DBS-IDEA
(312) 940-1010

CIRCLE 767 ON READER SERVICE CARD

Software Buying Guide

A guide to available programs. *The Software Plus Buying Guide* lists software by key features in such product categories as financial modeling, database management, word processing, games, as well as unusual and unique offerings.

The guide includes references to published software reviews. *(List Price: $2)*

UOI Co.
15445 Ventura Blvd.,
#1092-Al
Sherman Oaks, CA 91413
(213) 785-5050

CIRCLE 768 ON READER SERVICE CARD

Games, Graphics and Sound for the IBM PC

A guide in the use of graphics and sound to create computer graphics and animation. Over 70 examples lead the reader through the graphics creation process, in such languages as BASIC, Pascal, FORTRAN, and DOS Macro Assembler. The book, by Dorothy Strickland, Dennis Rockwell, and Kevin Bowyer, culminates with the reader creating his or her own video game.

Available separately are diskettes accompanying the guide's text, including all example programs listed therein. *(255 pgs. $17.95)*
Robert J. Brady Co.
Bowie, MD 20715
(301) 262-6300

CIRCLE 769 ON READER SERVICE CARD

Database Services Guide

A guide to using personal computers for accessing commercial database services, *The Complete Handbook of Personal Computer Communications*, by Alfred Glossbrenner, covers such services as are offered by CompuServe, The Source, TradeNet, and others. The book describes these databases, and shows the reader how their services can be used for researching and checking facts, for gathering news, as tools to aid in making important personal decisions, and even for shopping at home. Other services described in this book, with telephone numbers and addresses, allow a user to barter for goods and services, to bank via computer, or to obtain online advice about such matters as preparing for college exams. *(Paperback; $14.95)*
St. Martin's Press
175 Fifth Ave.
New York, NY 10010
(212) 674-5151

CIRCLE 770 ON READER SERVICE CARD



Guide to Microcomputer Buzzwords, Sams & Co.

User's Guide to Microcomputer Buzzwords

A plain-English glossary of computer terminology and jargon, giving the meaning, and origin, of hundreds of specialized terms. The book, by David H. Dasenbrock, is illustrated with photos, line drawings, and charts. *($9.95)*
Howard W. Sams & Co., Inc.
4300 W. 62nd St.
Indianapolis, IN 46268
(317) 298-5400

CIRCLE 765 ON READER SERVICE CARD

Update: Computers in Medicine

A bi-monthly journal focusing on computer technology in the practice of medicine. The journal, entitled, *Update: Computers in Medicine—The Practical Guide for Office Practitioners*, is sponsored by the Georgetown University School of Medicine. A Continuing Medical Education (CME) credit offering, based on the information presented in the text, will be a part of each issue. *(Subscription: $24)*
Medical Market Communications, Inc.
P.O. Box 3153
Princeton, NJ 08540
(609) 896-2168

CIRCLE 771 ON READER SERVICE CARD

Software Tutorials

A series of self-teaching guides with accompanying diskette. The training courses are available for *dBASE II, Lotus 1-2-3, Multiplan, WordStar, VisiCalc,* and *SuperCalc.*

The software tutorials are designed to present one concept per page, with corresponding points on the enclosed diskette. Concepts are further simplified through the use of supporting graphics. Formatted data diskettes are provided, with which course data can be loaded and saved. *(List Price: $39.95)*
The Computer Tutor, Inc.
554 Washington St., #3
Wellesley, MA 02181
(617) 237-6061

CIRCLE 764 ON READER SERVICE CARD

New On The Market

The Book of IBM Software-1984

A consumer's guide to software available for the PC and the PC-XT. The book features reports by individual expert evaluators. Types of programs reviewed include: business and financial; personal/home interest; education; utilities (assemblers, languages, telecommunications, compilers, graphics, disk utilities); games/entertainment.

Programs reviewed are graded on an A-to-F scale in such categories as ease-of-use, vendor support, documentation, value for money, visual appeal, reliability, and error handling. Each review also features a description of the program, reviewer's comments, and suggested list prices. A list of software vendors is also included. *(List Price: $19.95)*
The Book Co.
11223 S. Hindry Ave.
Los Angeles, CA 90045
(213) 410-9466

CIRCLE 766 ON READER SERVICE CARD

The VisiCalc Program Made Simple

A tutorial on video cassette providing instruction in the creation of *VisiCalc* worksheets and models. The tutorial begins with an introduction to the IBM PC and *VisiCalc*, and how to prepare diskettes for use. Next, guided by the video tape, the user builds a simple worksheet, learning commonly used commands such as Edit, Format, Global, Insert, Print, Replicate, Storage, and Window.

All sections of the tape can be found quickly using a minute-by-minute table of contents included in the accompanying guide. *(List Price: Beta, VHS: $129.95; U-Matic: $169.95)*
MicroVideo Learning Systems
119 W. 22nd St.
New York, NY 10011
(212) 255-3108

CIRCLE 762 ON READER SERVICE CARD



The Visicalc Program Made Simple, MicroVideo

SERVICES

Third Party Computer Repair

A third party repair service for personal computers, providing three types of services: walk-in, where the customer brings the equipment to the service center for repair; on-site service, where equipment is serviced at the customer's location; and courier service, where equipment is picked up from the customer and returned after repairs are completed. The repair service offers, in most cases, a turnaround time for the return of repaired equipment measured in hours, as opposed to days or weeks.

The company provides services to personal computer users within the San Francisco Bay area, with other regions expected to be served in the near future.
Computer Repair Corp.
1111 W. El Camino Real,
Sunnyvale, CA 94087
(408) 720-0944

CIRCLE 772 ON READER SERVICE CARD

ANNOUNCING THE MASTER DIRECTORY— THE COMPLETE GUIDE FOR YOUR IBM PC OR XT

Over 500 pages of listings for IBM-compatible hardware, software, accessories and services—from the publishers of *PC Magazine*...



There are literally thousands of different products on the market that are compatible with your IBM PC or XT. And new ones are being introduced every day.

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Please send me _____ copy(ies) of *PC: The Product Directory*. I enclose $7.95* for each copy, plus $1.50 for postage and handling.

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CIRCLE 298 ON READER SERVICE CARD

DISK MECHANIC T.M.

The ULTIMATE Backup, Analyze & Repair Utility
The Disk Toolkit NO IBM PC Should be Without
Protects Your Software Investment

BACKUP TOOLS:
- Can Backup Most Every Diskette
- SUCCEEDS where others fail!
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- Many Additional Analysis Tools

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- Show Disk & File Allocation
- Display & Alter File Data
- Repair Damaged Disks
- Recover Erased Files
- Alter "Hidden" Status
- Search Files For Data

SECTOR TOOLS:
- Examine/Print Sector Data
- Modify (ZAP) Sector Data
- Compare, Copy & Zero Sectors
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HACKER TOOLS:
- Modify Floppy Disk Controller Parameters
- Supports All FDC R/W Commands

DISK MECHANIC works with all standard IBM PC disk formats including "protected" diskettes with mixed track and sector sizes, blank and high track formatting, CRC errors, and single or double sided drives. DISK MECHANIC requires an IBM PC with 128K of memory or COMPAQ with 192K of memory, DOS 1.10, and 2 floppy disk drives. DISK MECHANIC includes a detailed 48 page instruction manual. To Order DISK MECHANIC send check or money order for $70 plus $3 for shipping (Mass. res. add sales tax.) to: MLI MICROSYSTEMS, Box 825, Framingham, Mass. 01701 or Call (617) 926-2655 for Mastercard or VISA orders. Dealer/Distributor inquiries welcome. © 1983 MLI MICROSYSTEMS.

MLI MICROSYSTEMS

CIRCLE 340 ON READER SERVICE CARD

ELIZA IS HERE!

AT LAST! A FULL IMPLEMENTATION of the original ELIZA program is now available to run on your IBM Personal Computer!

Created at MIT in 1966, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA turns your computer into a non-directive psychotherapist with whom you can converse much as you would with a live therapist. She analyzes each statement as you type it in and then responds with her own comment or question. Response time is virtually instantaneous, and her remarks are often amazingly appropriate!

Designed to run on a large mainframe, ELIZA has never before been available to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so fascinating.

Now, our new IBM PC version possessing the **FULL** power and range of expression of the original is being offered at the introductory price of only $25. And if you want to find out how she does it (or teach her to do more), you can buy the complete IBM Disk BASIC **SOURCE PROGRAM** for only $20 additional.

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say, "Okay, let's see what this computer of yours can actually do!"

AVAILABLE ON DISK IN TWO VERSIONS FOR THE PC

1. Protected Version $25
   (Protected Version can be run but not listed or modified)
2. Un-protected IBM Disk BASIC Source Version $45
   (Source Version can be listed and modified as well as run)

Both versions include a six page user manual.

Please add $2.00 shipping and handling to the above amounts (California residents add 6% sales tax)

ARTIFICIAL INTELLIGENCE RESEARCH GROUP
921 North La Jolla Avenue, Dept. P
Los Angeles, CA 90046
(213) 656-7368 (213) 654-2214

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CIRCLE 128 ON READER SERVICE CARD

CIRCLE 128 ON READER SERVICE CARD

SDA

WHAT IS IT?

The premium SCREEN DESIGNER for the BASIC LANGUAGE on the IBMPC.
As much as 50% of programming development effort is spent in coding screen displays. Think about it, 50% of your time. . . . Time is money.
SDA gives the BASIC language programmer a very fast, very powerful, easy to use tool that automates screen construction programming. With one tool, create and maintain, sophisticated, professional quality, protected format, fully documented screen displays normally found on larger computers.

WHAT IT DOES

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-Automatic field integrity
-Insert, delete, destructive back space, cursor right or cursor left in any field
-(.), (–), /) NUMERIC EDITING
-DATA TRANSFER to/from program by complete record, not field
-RECOVER DATA lost by overstrike
-Eliminates field overrun
-Automatic DATE/TIME option
-Numeric validation, zero fill, rht. adj. numeric
-Eliminates 'redo from start'
-Any combination of normal, high intensity, reverse or blinking VIDEO character display
-No cursor movement out of fields
-Unimpaired use of FUNCTION KEYS
-REQUIRED FIELD ENTRY option
-and MORE

HOW IS IT USED?

SDA is a SCREEN PAINTER, simply key descriptions, labels or ? anywhere on the screen, define your fields and SDA does the rest. It's that easy.
-Automatic line centering
-Move entire lines right or left
-Fields easy to define, review
-Insert or Delete lines
-DRAW boxes, lines, hi-lights, etc
-Much MORE

HOW DOES IT INTERFACE?

SDA creates BASIC, version 1.1, code, in ASCII format. Is easily 'MERGE'd or compiled into any program, or 'CHAIN'ed from diskette. The code for each screen is fully contained in a subroutine.

WHERE TO GET SDA?

SDA is available only from:

AUE COMPUTER ENTERPRISES
P.O. Box 6376
Concord, Calif. 94524
PH: (415) 229-2537

Software is provided on 5¼" diskette with full user documentation. Price . . . $149.50 (plus shipping) California residents include 6½% sales tax.
We accept checks (10 days to clear), money orders, VISA or MASTER CHARGE

CIRCLE 167 ON READER SERVICE CARD

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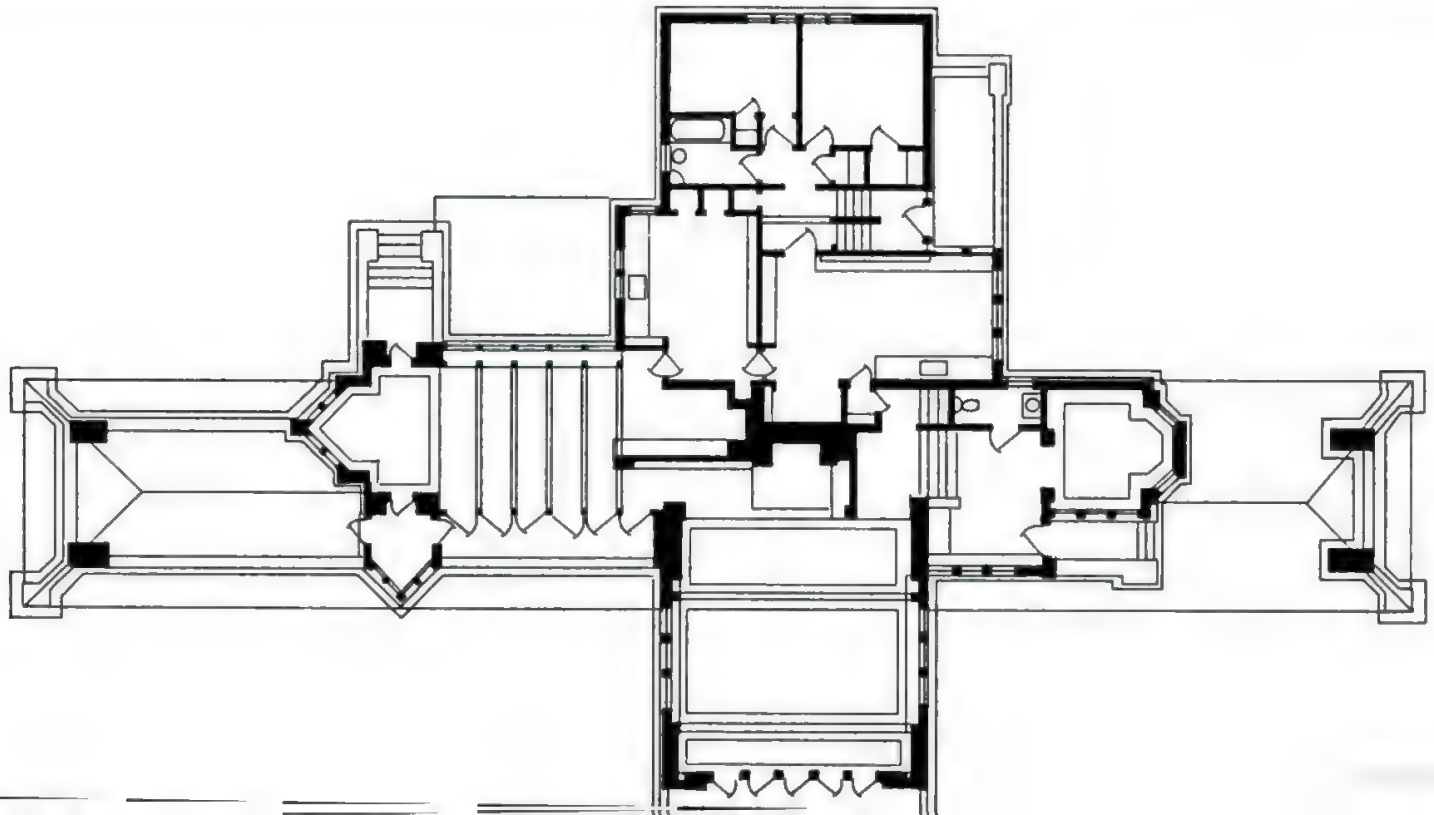
For a demonstration and information, call or write.
Autodesk, Inc.
150 Shoreline Highway—Building B
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AUTOCAD

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Take a look at FormManager, a remarkable tool to automate your office. FormManager actually combines data entry, data management, data processing and forms processing into one integrated package.

Forms generation made easy.

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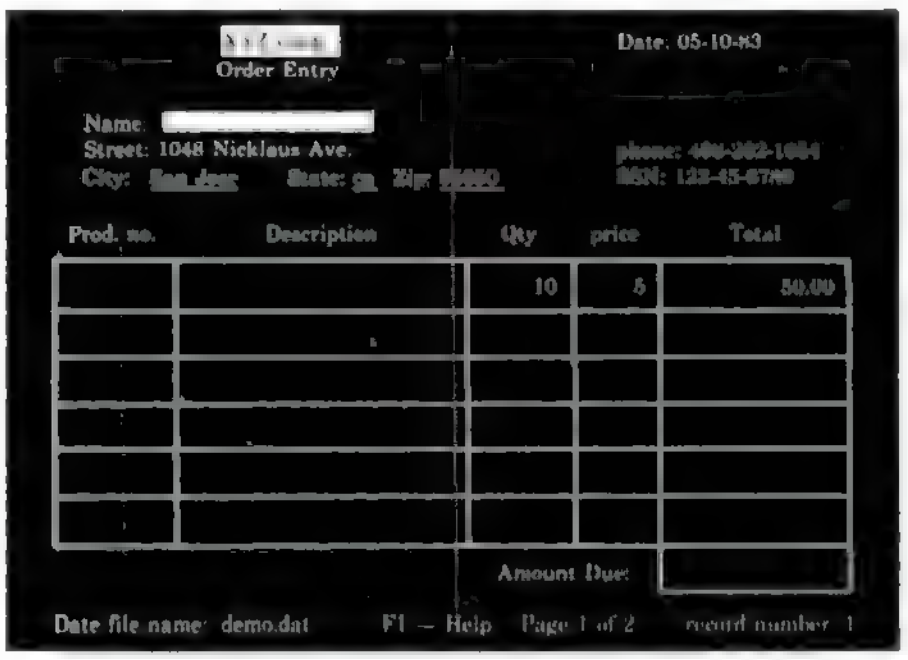
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IF state = "CA" then TAX = sub_total * 0.065.



Printing, of course.

Print functions allow you to print from the screen to your pre-printed paper form. Or you can select to print any number of fields from all your records.

With these features, you can tailor such things as mailing lists, inventory control, expense reports, etc., to fit your unique applications.

See FormManager today at your local computer store.
Or order it at:
Alamo Electronic Components, Inc.
(408) 578-1490.

Retail price: $195 Tutorial disk: $15

Dealers, send for your free tutorial disk.

Requires 128K RAM, two 320K disks.
DOS 1.1 or 2.0 Color or monochrome.

bit BIT Software Inc., Box 619, Milpitas, CA 95035. (408) 262-1054.

CIRCLE 107 ON READER SERVICE CARD

PC: BlueBook

Rates and Information

PC: BlueBook is a high-response, low-cost source for advertising in the fastest growing computer market in the world. Advertisers choose between set categories and may include a logo. Display advertisers may cross-reference to their current display ad.

Circulation: 150,000 Paid Circulation Rate Base
Readership: 300,000 Est.

AD STYLE: 1 line Heading (25 characters maximum)
7 lines Body Copy (45 characters per line)
4 lines for Company name, address and telephone

RATES: Per Issue: $150
Additional Lines: $15 per line
Logos: $300 (4 issues)
Minimum Order: 4 issues
Terms: Prepayment is required. Check, money order, American Express, Diners, VISA or MasterCard are accepted.

DEADLINES: December 13th for the February 21st issue, on sale January 31st. Send your ad and prepayment to:
PC BlueBook
Classified Advertising, 12th Floor
One Park Avenue
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Advertising sales: (212) 725-4215
Customer service: (212) 725-4312

Accessories/ Furniture

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722-J Genevieve Street Dept. C312
Solana Beach, CA 92075
(619) 755-8324

Accessories/ Supplies

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Over 450 Computer forms including Checks, Statements, Invoices, Tax forms, "No-perf" letterheads, envelopes, mailing labels, etc. Forms designed for Accounting Plus, BPI, CYMA, Continental, Great Plains, MBSI, Peachtree, and State of the Art. 24 hour shipment on non-imprinted stock, free shipping on most forms.
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(800) 528-2361, (602) 998-1577

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Custom-made, quilted dust covers—anti-static, machine washable. Offered in 6 colors: grey, chocolate, cream, burgundy, navy or rust. Any cover can be made-to-order. SYS/MON (1 or 2 pc) & Kybd $50 per set. Nar prnt $20. Wide prnt. $24. Ind unit prices available. Please see display ad this issue
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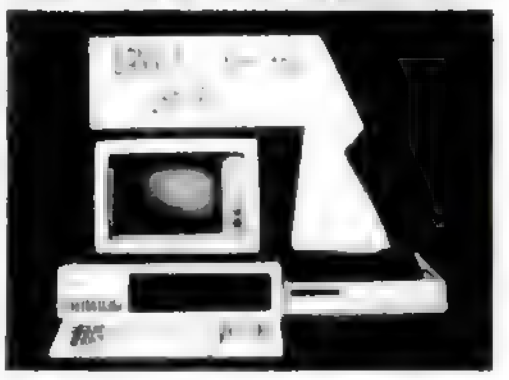
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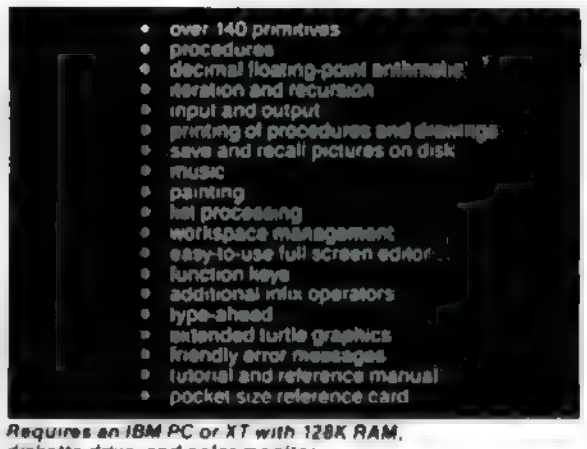
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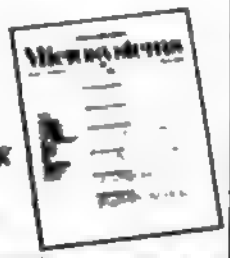
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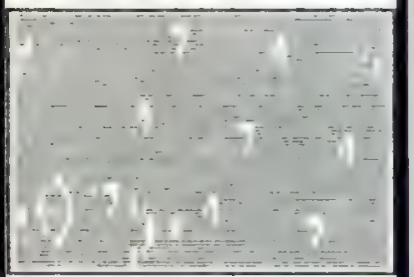
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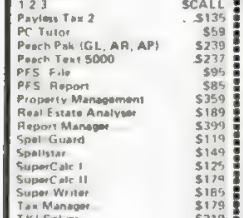
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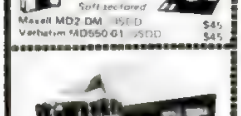
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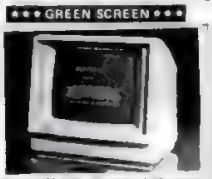
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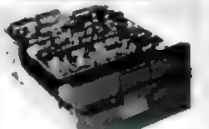
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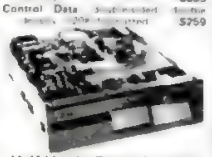
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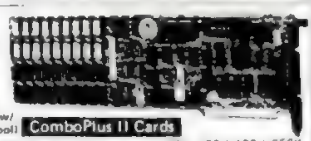
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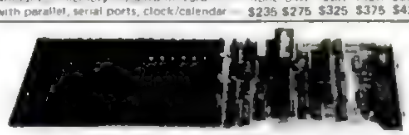
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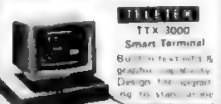
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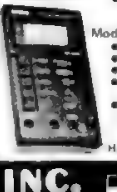


Compact size 6"x3"x1½"

Model SK-6440

- 3½-digit LCD with auto unit and sign indications
- Full autoranging on Volt and Ohm with 10A AC, DC range
- Input value can be put into memory to make difference measurements like a galvanometer
- Autoranging Voltage Test: 200mV, 1000V DC, 2V, 600VAC
- AC, DC Current Tests: 200mA, 10A
- Resistance Tests: 200Ω, 2000kΩ
- Autoranging Low Power Ohm Tests: 2kΩ, 2000kΩ
- DC Volt Accuracy: ±0.8% reading, +0.2% full scale
- Low Battery Consumption: 300 hrs. on two AA batteries
- Submerged connectors for added safety
- Folding tilt stand for easy viewing
- Dual fuse for safety protection

SK-6440 *Special!* **$89.50**

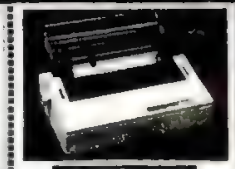


Model SK-6330 All the above plus these additional features:

- DC Volt Accuracy: ±0.5% reading, +0.2% of full scale
- Built-in Beeper for continuity tests, overload warning
- Extended AC, DC current range: 20mA, 10A
- Manually overrides the autoranging function so desired range can be selected for voltage and resistance measurements
- Zero Adjust function cancels the resistance value of test leads for the easiest and most accurate measurements

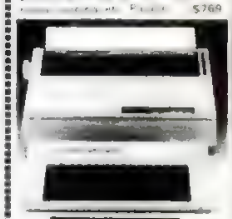
SK-6330 **$129.50**

HARD CASE for above two models ... $10.00



BROTHER HR-25

New [illegible] w/ 2 [illegible] 18 [illegible] printer [illegible] ... $769



DYNAX DX-15

New! [illegible] quality easy-view [illegible] paper & [illegible] 1K buffer. Parallel ... $CALL
Serial ... $CALL
Ethernet [illegible] ... $199
Tractor ... $119
Keyboard ... $179
Friction feed ... [illegible]



DAISYWRITER 2000

The [illegible] letter quality printer w/ 4K buffer, bi-directional, 17 CPS, [illegible] & [illegible] as [illegible] all other [illegible] features ... $1,069

COMREX CR-1

17 CPS letter quality printer [illegible] Parallel ... $CALL



FUJITSU SP-830

A [illegible] with [illegible] high 80 CPS [illegible] and [illegible] matrix [illegible] features ... $2,095



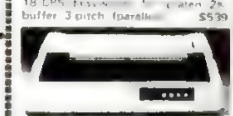
TOSHIBA P1350

Superb [illegible] with 24-pin [illegible] head, 192 CPS draft [illegible] ... Call



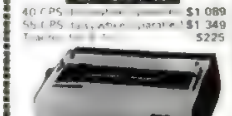
JUKI 6100

18 CPS [illegible] letter quality 2K buffer, 3 pitch (parallel) ... $539



C. ITOH F-10

40 CPS [illegible] printer [illegible] ... $1,089
55 CPS [illegible] above, parallel ... $1,349
Tractor for [illegible] ... $225



TRANSTAR 130P

Letter quality, [illegible] printer. 16 CPS, bi-directional [illegible] short line seeking, [illegible] 2K buffer, 6 [illegible] font [illegible] 80 [illegible] Parallel ... $699

SILVER REED EXP-550

16 CPS, [illegible] letter quality, [illegible] 2K buffer, [illegible] Parallel ... $669



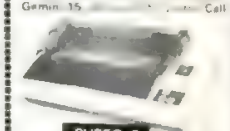
EPSON

FX-80, 160 CPS, [illegible] ... Call
FX-100, [illegible] ... Call
RX-80, MX-80 F/T, MX-100 [illegible] ...



STAR GEMINI

Gemini 10X, [illegible] ... $Call
Gemini 15, [illegible] ... Call

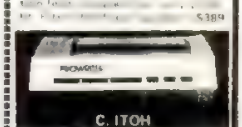


SUPER 5 (CP-80)

[illegible] 640 graphic dots [illegible] on other [illegible] & [illegible] wide paper [illegible] ... $339

RITEMAN

120 CPS, [illegible] [illegible] for [illegible] ... $389



C. ITOH

8510AP Prowriter [illegible] ... $Call
1550 Prowriter II [illegible] ... $Call



NEC

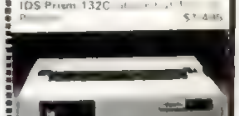
NEC SPINWRITER 3550

[illegible] 80 [illegible] ... $1,850
Tractor [illegible] ... $245
8023A [illegible] ... $189



IDS PRISM

IDS Prism 80C [illegible] ... $1,259
IDS Prism 132C [illegible] ... $1,445



OKIDATA

ML 82A, 120 CPS, [illegible] friction feed, serial & parallel ... $379
Okigraph I 82A, 60x66 DPI dot [illegible] ... $45
ML 83A, 120 CPS, 136 col., tractor & friction feed, parallel/serial ... $629
Okigraph I 83A, 60x66 DPI [illegible] addressable graphics for 83A ... $45
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ML 84S, [illegible] ... $1,059
ML 92P, 160 CPS, 80 col., friction & tractor feed (parallel) ... $499
ML 92S, [illegible] ... $599
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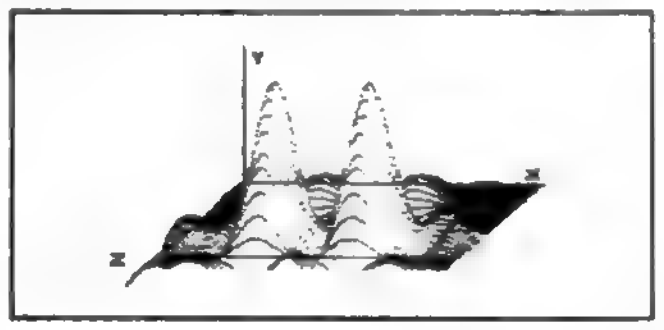
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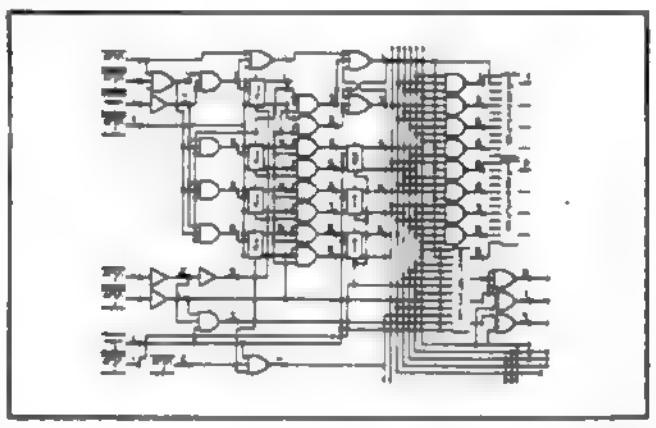
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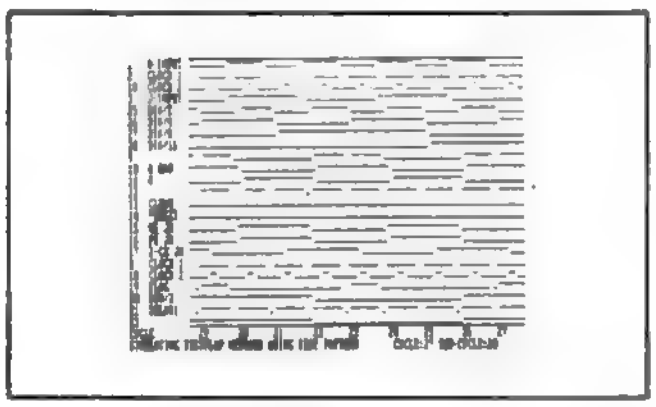
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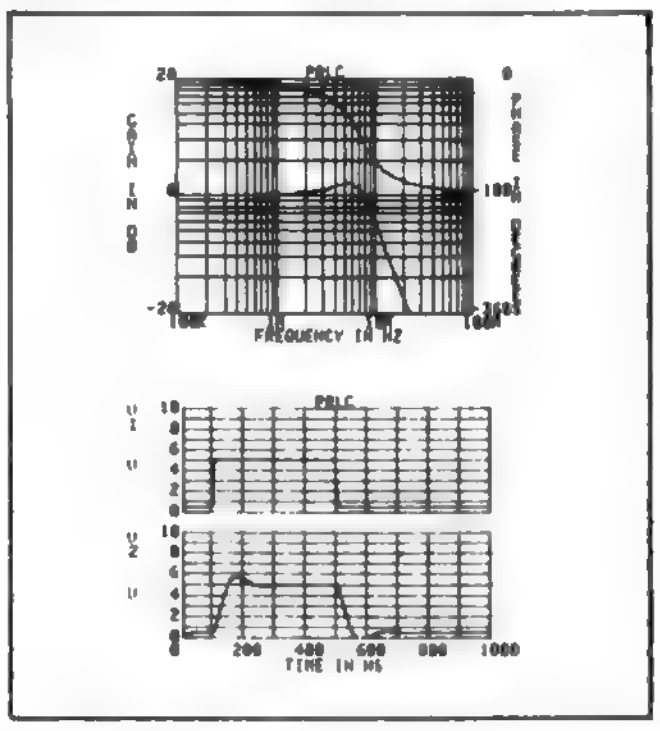
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You may not want to make the switch from PC-DOS 1.1 to 2.0, but when future versions are announced, you'll be glad you did.

Confessions Of A Dual-DOS Personality

I suffer from a serious affliction known as dual-DOSity. Here's the major symptom: By day, I use PC-DOS version 2.0; by night, I use PC-DOS version 1.1. I'll tell you some of the reasons why I do this and whether I can (or want to) be cured.

When IBM announced the first upgrade to PC-DOS version 1.1, I snapped it up quickly. The new product offered many improvements over the first version, 1.0, as well as a number of needed repairs. To make it interesting, IBM also cut its margins on disk access time, causing file operations to run noticeably faster. DOS 1.1 also supported double-sided diskette drives with their 320K capacity. While a large number of users complained about having to pay the price of the operating system ($40) over again to get the changes, the majority of them seems to have done so nonetheless.

I was very satisfied with DOS 1.1. The improvement in disk speed was much needed and appreciated. I rapidly upgraded to the double-sided disk drives, even though many of my diskettes remained formatted at the 160K capacity (an important fact I'll come back to in a moment). I found that most of my software (purchased and written) ran without problem in the new environment. For those few programs I owned that did not work, the vendors supplied upgrades quickly. All things considered, I could find nothing to complain about.

What is significant about my conversion to DOS 1.1 is that there was really no conversion at all. Nothing forced me to use double-sided disks; I simply did so because I was ready to, and it seemed appropriate. All the software ran. DOS 1.0 diskettes could be converted to DOS 1.1 very simply by issuing a SYS command. There was no change in disk format; it was a cinch.

A very important consideration in my case was my electronic disk software. I was worried that it might not work in the new DOS, but it did. It was necessary to take the time to reinstall the driver, but this was a minor inconvenience. For many reasons, I do not wish to part with that particular program.

When I opened the *PC Tech Journal* editorial office, I used the same software configuration on the office machines as I used at home. This was very convenient, as it allowed complete portability of data and system diskettes among the various systems.

And then it happened. IBM announced the XT and a new version of its operating system, DOS 2.0.

The Demise of Will's RAMdisk

As editor of a computer publication, it was natural that I would obtain the next, best computer IBM Offered. (I'm getting a 3084 next week.) Unfortunately, it was at

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this point that the trouble began.

In order to use my new XT, I had to use DOS 2.0. In fact, I didn't mind doing so because the new version of DOS has many enhancements that make it a very desirable environment in which to work. I purchased the machine with 256K of memory and assumed that the combination of the memory and the fixed disk would provide me with adequate performance. This turned out to be quite true. However, the other machines in use in the office and at my home had become dependent on the electronic disk. The particular electronic disk software we had been using was not compatible with DOS 2.0, and, for more reasons than I can go into here, no update was forthcoming.

So I made some rules. I would use DOS 2.0 on the XT, and everyone else would continue to use DOS 1.1 with the electronic disk. I would format all diskettes to 320K to ensure full compatibility among all our systems, including my own.

These rules lasted about a month. The acquisition of another fixed disk (in the form of the IBM Expansion Chassis) brought a second staff member to DOS 2.0, and a third staffer began to use DOS 2.0 exclusively in order to take fuller advantage of the more extensive file system, which included directories. Both staffers also used the higher capacity 360K format for diskettes.

By this time, we had a number of alternative electronic disk software packages to choose from. Initially we used the software that came with our memory expansion boards (purchased after the introduction of DOS 2.0 and therefore including updated software), and later we switched to a package we liked a little better. My earlier decision to use 1.1, based on my desire to use the original electronic disk program, came into question. Finally, in a glorious fit of disk reformatting, file transfers, flaring tempers, and my calming influence, the office converted to DOS 2.0. Miraculously, we lost nothing in the process.

THE OFFICE adjusted quite rapidly. Everyone continued to work as if nothing had happened.

The Office Adjustment

I was worried that the conversion to DOS 2.0 would create problems for the major software packages we were using, especially for the word processor. Fortunately, our word processing program had already been converted and operated nicely in the new environment. The DOS 2.0 directory structure is handy and necessary with a fixed disk, but it creates problems if a program is invoked from one directory but requires files (such as its own overlay or help messages file) from another directory. Of all the programs we use or have evaluated, it was the only one able to find its files under all conditions of its invocation.

The office adjusted quite rapidly. After the initial confusion of the conversion, everyone continued to work as if nothing had happened. And this is the most important point: except for those staffers with hard disks, everyone uses DOS 2.0 just as they used DOS 1.1.

For a system with diskettes only, many of the enhanced features of DOS 2.0 are not helpful. While directories might help in organization, they consume additional diskette space. While the pathname search feature is mandatory for a fixed disk system with many directories, it confuses the situation on a diskette-based system if media are continually being switched. These same features also make the system more difficult to learn and can sometimes behave in a peculiar manner if the user is not well-versed in their operation. So using DOS 2.0 as if it were 1.1 can be useful: programs have the advantage of an improved environment in which to operate, while users can pretend that nothing is different.

What About Will?

The same problems that drove the office to DOS 2.0 are now disrupting my personal life. Ignoring the fact that I sometimes bring home a 360K diskette, there is much software now that requires DOS 2.0 or operates more completely within it.

I have resisted the temptation to convert for a long time, but I am finally at the breaking point. For an individual user, conversion may not be an easy decision to

make because of the expense.

First, I have to buy DOS 2.0. Actually, I have already done so for business reasons, but it is a factor when considering the bottom line. Cost: $60. Next, I have to buy a new electronic disk. A number of hardware vendors offer their electronic disk software as a separate product (see the review of multifunction cards in the January issue of *PC Tech Journal*). The most well-known independent product is probably *JetDrive 2.0* from Tall Tree Systems. Cost: $40 to $100.

Next, I have to consider the amount of main memory in my machine. Currently at 320K, and divided into 128K main and 192K disk, this is not enough to make me compatible with the office. Although most software will work in 128K, DOS 2.0 will push a few packages to 192K, and many vendors recommend up to 256K to obtain the best performance and functionality from their products. In addition, most of the electronic disks I have looked at use more memory for overhead than my original version. Because performance was somewhat marginal at 192K, more memory is needed there, too. My decision is to buy the piggyback board for my AST MegaPlus and expand to 256K main, 320K (less overhead) disk. Cost: $395 to $695, depending upon how I go about it.

FOR A system with diskettes only, many of the enhanced features of DOS 2.0 are not helpful.

Next, I have to perform the conversion. I am pretty well organized at home, so only four or five disks will have to be rebuilt with DOS 2.0. About eight others will be reformatted to 360K. The rest, about 50 or so, will stay as they are. Some of these are 160K, but since I organize data by function or usage, I am not likely to reformat these diskettes until such time as their data storage requirements rise within 20 percent of capacity. Cost: about 6 hours of my time (I ain't cheap, either!).

Finally, I will have to determine which of my software packages have problems running with DOS 2.0 over DOS 1.1. Those will have to be given up or replaced. The only one I really worry about is my graphics screen dump program, which is more sophisticated than the function available in DOS 2.0. There might be others. Cost: probably $60.

The bottom line: my cost to convert will be somewhere between $555 and $915. Or put another way, somewhere between 11 and 18 percent of my original system purchase price which is not at all insignificant.

So Why Bother?

The conversion to DOS 1.1 was pretty simple. The conversion to DOS 2.0 is harder and, depending on the point of view, not necessarily worth it. I'll probably use the system at home just as I would have with DOS 1.1 (no directories, limited use of extended functions). I could suffer some inconvenience and examine at the office those packages requiring more resources than I have at home. So why

THE OFFICE converted to DOS 2.0. Miraculously, we lost nothing in the process.

bother? Why convert now or at all?

Because sooner or later IBM will announce a new operating system, either an upgrade to DOS (maybe version 3.0) or something different. I'll call it DOS X. I predict that the conversion from 2.0 to DOS X will be as troublesome as the conversion from 1.1 to 2.0 was, probably worse, if history teaches us anything. But it will certainly be easier than a conversion from 1.1 to X! The greater the distance between operating system revisions, the more difficult the conversion will be.

When DOS X comes, I want to be ready. */PC*

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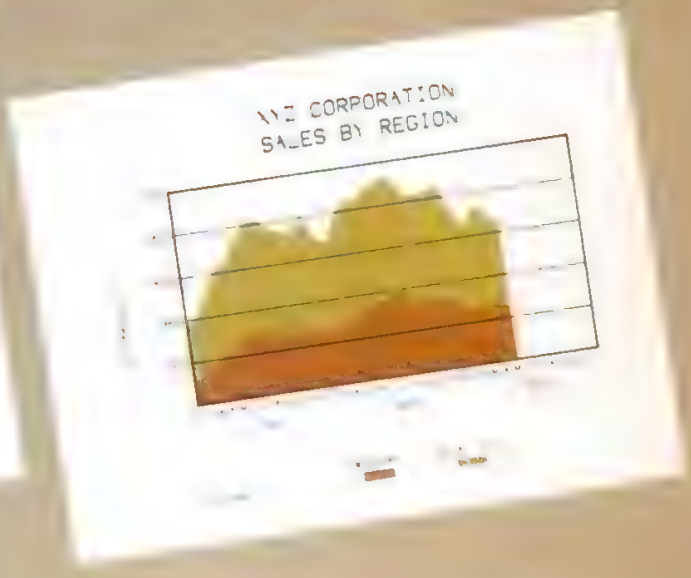
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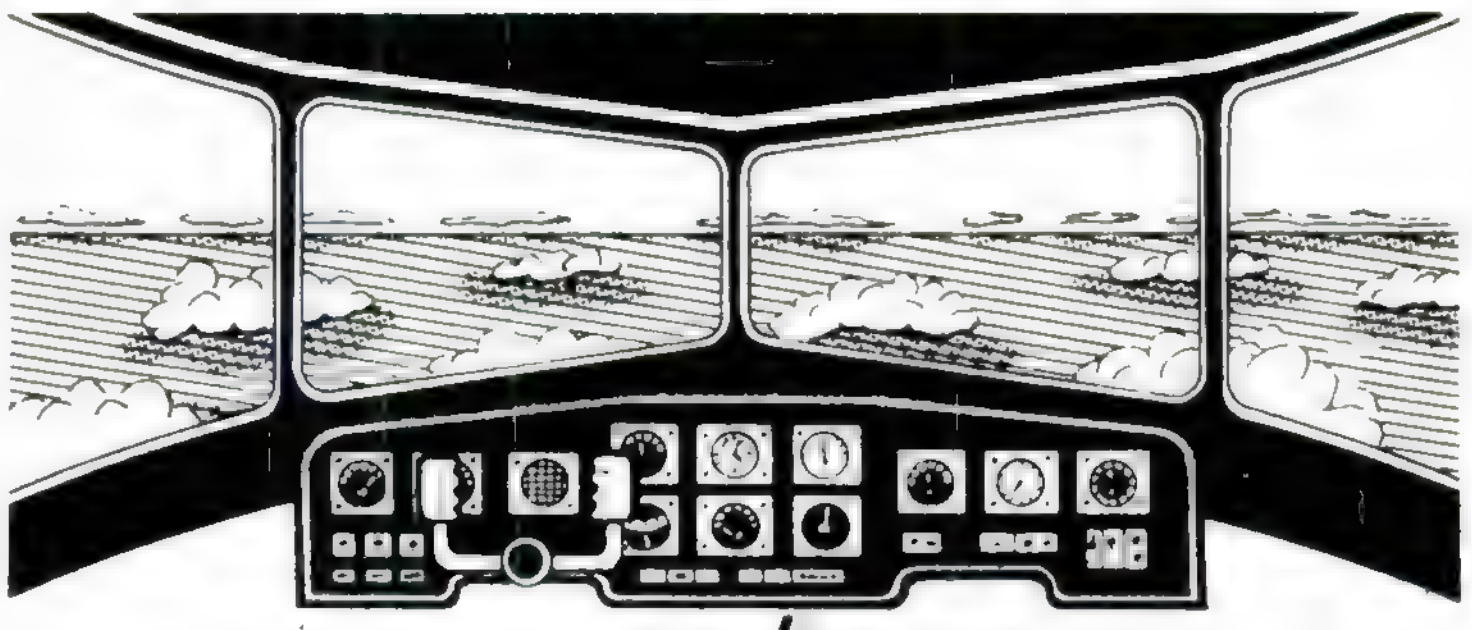
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Coming Up



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In PC's first issue of the new year, contributing editor Lindsy Van Gelder explores the Orwellian issue of computer privacy and comes up with some surprising conclusions.

Adapting the PC Keyboard for the Handicapped

The PC keyboard has been off limits to many potential users who, because of a handicap, are unable to press more than one key at a time. We'll present a BASIC program that changes the meaning of the shift keys, making the PC accessible to virtually everyone.

Inside Modern Monitors

What goes on inside the monitor that sits atop your PC? Tune in next issue as PC discusses different types of terminals and the electronic processes they use to give life to your screen.

A Programming Language

Aptly named with the humble acronym, APL, this programming language is known for its economy of expression. Some users prefer its efficiency and flexibility to BASIC. We compare the two languages.

De-Dedicating the Office

As more and more IBM PCs make their way into large and small businesses, software companies are designing word processing programs that operate like easy-to-use dedicated machines. *PC* examines several office word processing packages for this growing environment.

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